The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 40. OCTOBER 1, 1932. VOL. XII.

N.V.M.A. Congress Papers

No. 6.—CLINICAL EXAMINATION OF THE COW'S UDDER*

R. SIMPSON, F.R.C.V.S., D.V.S.M.
CHIEF VETERINARY OFFICER, CUMBERLAND

The trend of recent legislation affecting the milk supplies of this country has undoubtedly focussed an increasing amount of attention on the question of the clinical examination of the cow's udder. The public demand for protection from milk-borne disease has grown in volume within the last ten or twenty years, and in consequence, the veterinarian's responsibilities in relation to the maintenance of a pure milk supply have been greatly extended.

A very considerable section of the veterinary profession is now engaged in the supervision and inspection of the milking herds in this country, with a view to safeguarding the milk consumer from tubercle and other specific infections which may be conveyed by milk. In Scotland routine clinical examination of milk cows is compulsory. In England and Wales, the position is less satisfactory, the legislation merely providing powers which are of a permissive nature. Nevertheless, a very considerable amount of routine inspection is carried out in England and Wales in a large number of urban areas and in not a few rural districts.

The veterinary profession has consistently recommended routine clinical examination of dairy herds as an essential part of any campaign for the eradication of bovine tuberculosis, and also as a necessary measure for the protection of the milk consumer. Success in this direction depends on careful and accurate clinical work, which undoubtedly calls for considerable experience in the individual, with the consequence that this work is becoming increasingly recognised as part of a special branch of veterinary practice.

No one who has carried out routine examination of dairy herds over any considerable period will deny the many inherent difficulties in connection with the work. It is only continual practice which does result in a finer sense of touch and a progressive development of clinical sense and instinct which are so difficult to define and which are yet so characteristic of the successful practitioner. One is bound to admit that clinical diagnosis in the udder has certain limitations, and to admit further, the necessity for accurate microscopy as an essential adjunct to clinical examinations.

The question of tuberculous mastitis must necessarily occupy a considerable amount of attention in such a paper as this, particularly on account of its public health aspect, and no doubt the invitation to me to prepare this paper resulted from the fact that a large part of my official duties is devoted to the control of this condition and the detection of other pathological conditions which are enumerated in the Milk and Dairies Acts and Order. It is difficult to compress within the limits laid down for Congress papers a complete review of all the pathological conditions of the udder which may be found, and it seems desirable, therefore, to limit oneself to those conditions of the udder which are most commonly met with during systematic examinations, without attempting to deal with teat conditions in detail, except in so far as these assist in reaching a diagnosis of an abnormal condition of the udder.

In so far as legislation is concerned, it should be noted that Section 5 of the Milk and Dairies (Consolidation) Act of 1915 prohibits the sale of milk from cows affected with tuberculosis of the udder and with acute inflammation of the udder, and in the second schedule of the same Act, certain other diseases, including actinomycosis of the udder and suppuration of the udder, are included. The Milk and Dairies Order of 1926 adds to the diseases specified in Section 5 of the Act, any infection of the udder or teats which is likely to convey disease. It should also be borne in mind that the Tuberculosis Order makes provision for the compulsory notification of cows which are suffering from any chronic disease of the udder, induration or tuberculosis of the udder.

Methods of Examination

The recognition of pathological conditions in the udder by clinical examination necessitates primarily a thorough knowledge of the structure, appearance and feel of the normal udder and a knowledge also of the ordinary physiological variations. Factors such as age and breed are of importance in this connection. The stage of lactation has also an important bearing on the appearance of the udder. The presence of œdema associated with parturition results in a temporary variation which makes

* Presented to the Veterinary Medicine and Surgery Section, N.V.M.A. Jubilee Congress, Folkestone, 1932.

DEPT. OF VET. MEDICINE

the recognition of pathological changes at that particular time a difficult matter. It is not unusual for this œdema to persist for some time after parturition and to give the appearance of induration.

In carrying out an examination of the udder, either in individual cases or during routine inspection, the general appearance of the udder should be noted, and any swelling or distortion of the quarters observed. Thorough palpation of each quarter of the udder is essential. During routine inspection the examination should neither be hurried nor any attempt made to aim at numbers at the expense of thoroughness. Routine inspection is tedious and it involves considerable physical effort. If large numbers of cows are examined daily, there is a tendency for the work done in the latter part of the day to be less thorough and painstaking than should be the case. Each quarter requires palpation not only superficially, but deeply, and both hands are required, so that each quarter in turn is thoroughly compressed and examined. The tissue on either side of the division between the hind quarters should be carefully palpated. A mere superficial handling of the udders plus a few questions put to the owner, does not constitute clinical examination. Attention should be paid to the teats themselves; each one should be handled and a stream of milk drawn if necessary. The appearance of the milk and the presence or absence of flakes should be observed. The teats should be further examined for the presence of fibrous thickening, and the condition of the ends also observed for scars or other signs of damage, and any appearance of scabs or scales at the end of the teats should be looked for. Stenosis of the teat, causing hard milking, often produces some swelling of the quarter involved, which has no pathological significance. In the same way, inefficient milking of one quarter may also cause some alteration of its appearance.

Both supramammary glands should be examined as far as their situation makes this practicable. When difficulty is experienced in palpating the glands, movement of the hind leg outwards and forwards often assists in making these glands more accessible to the fingers.

There can be no question that the examination of the udder is greatly facilitated if the cow is milked out, and when any abnormality of the udder is noted, particularly any abnormality suggestive of tubercle, this procedure should always be adopted. Power is given in Part IV of the Milk and Dairies Order to require the owner to milk out a cow for the purpose of a thorough examination, but naturally, this power should not be resorted to unnecessarily.

The difficulties of routine clinical examination of the udder are considerably increased the nearer the approach to milking comes. It is questionable, therefore, if it is profitable to carry out these routine examinations late in the evening and close to the evening milking. In my view, examinations which are carried out on a routine basis within an hour or so from the time of milking will prohibit accurate clinical work, and probably only result in the grosser pathological conditions being detected. Similar difficulty arises in carrying out inspections of newly-calved cows and heifers in markets. The œdematous condition of the udder entirely prohibits an accurate examination being carried out.

In all pathological conditions met with in the substance of the udder definitely suggestive of tuberculosis, examination of samples of milk either by microscopical or biological methods is necessary to ensure an accurate diagnosis. In the great majority of cases where tuberculosis is suspected, microscopical examination of a milk sample, if properly and carefully carried out, will enable a definite diagnosis to be made. Where routine examinations are being carried out with the detection of tubercle as the main objective, the amount of sampling necessary will vary with the individual, according to his experience and skill. With increasing knowledge and confidence in appraising the significance of the various udder conditions met with, the amount of sampling can be definitely curtailed, always bearing in mind the fact that it is better to err on the safe side and sample if the clinician has any doubt as to the nature of the condition present, and especially if the lesion is suspected to be tuberculous in origin. It must also be borne in mind in considering the question of sampling, that mixed infections in the udder are not uncommon and that these are liable to escape notice if sampling is omitted when the clinical evidence is possibly rather against the lesion being tuberculous.

The collection of milk samples should be carried out carefully. The quarter or quarters and the teats from which the sample is to be drawn should be cleansed thoroughly, and the sample collected in a sterilised bottle; about four to six ounces will generally be found sufficient. The first milk should be discarded and a sample of either mid-milk or strippings taken. In examination for tubercle as well as other micro-organisms, either the middle milk or strippings will give equal success. Begg has shown that the strippings in a tuberculous mastitis are generally richest in bacilli. In a few cases, however, the middle milk gave better results. Generally speaking, it is quite a simple matter to make the sample representative of both the middle milk and the strippings. Before any of the strippings are taken, it is quite good policy to massage the quarters thoroughly.

I do not propose in this paper to go into a detailed discussion of microscopic methods, except to emphasise the point that the clinician should carry out his own microscopic examinations. The time required is not excessive, nor is any elaborate equipment necessary. There can be no doubt that the microscopic examination will, as a rule, be carried out more thoroughly and more efficiently than by the detached laboratory worker if the clinician will only take the trouble to acquire the necessary proficiency. This is particularly so in suspected cases of tuberculous mastitis, where a microscopic examination of milk samples is an essential part of the procedure in diagnosis. The veterinary practitioner who has the clinical signs in mind is in a much better position to assess the value and significance of his microscopic findings, and to know whether a biological examination of the milk is necessary or where further samples should be collected for examination by microscopic methods.

In carrying out clinical examinations of the udder, the general condition of the animal should also be noted, particularly if abnormalities in the udder are found. The presence of symptoms and lesions elsewhere may occasionally afford some evidence in assisting to estalish the nature of any pathological condition present in the udder.

Enquiries should always be made into the animal's history. Information should, if possible, be obtained as to the duration of any abnormality noted in the udder, and as to whether the condition developed suddenly or not. The possibilities of injuries and contusions should be enquired into. As a general rule, however, the history provided by the average owner is not to be regarded as being really reliable. In my experience, it is safer not to be too credulous in regard to the information vouchsafed during routine inspection. More reliance should be placed on one's own clinical examination and one's power to appraise the extent and nature of any abnormality present.

The tuberculin test is of little value in assisting in the diagnosis of tuberculous mastitis. Obviously a positive result is of no assistance towards allowing a diagnosis of tuberculous mastitis to be given. A negative tuberculin test does, however, at least eliminate the question of a tuberculous lesion in the udder, providing tuberculous disease is not widely distributed through the animal's body.

It is not within the scope of this paper to refer in detail to microscopic methods and technique in the examination of milk samples, but it is desired to lay emphasis on the importance of these examinations as an extremely valuable and reliable aid to clinical diagnosis. The microscopic examination of milk entails no great amount of labour and time for the clinician, and there are, as already indicated, reasons for such work being done by the clinician himself, rather than relying upon a laboratory for assistance.

In carrying out a microscopic examination, the nature of the centrifugalised deposit should be carefully noted, and particular attention should be paid to the amount present, its consistency and the presence or absence of blood. In the majority of cases blood content in the deposit indicates the occurrence of mastitis, but it is not uncommon to find tubercle bacilli also present when there is a fairly heavy blood content present, indicating a mixed infection. A microscopic examination of the deposit should be directed to the cell content of the milk and the presence of fibrin, in addition to searching for micro-organisms.

Torrance has shown that it is possible by concentrating on the cell group method of examination to obtain positive results in 93·15 per cent. cases of individual tuberculous milk samples. The annual report of the Chief Veterinary Officer for Liverpool indicates that a similar high percentage of positive results is also obtained in his department. My own records show that approximately similar results have been obtained.

The importance of obtaining a speedy diagnosis of udder abnormalities suggestive of tuberculosis must be borne in mind, owing to the fact that considerable inconvenience and loss is occasioned to farmers if no opinion can be expressed without constantly resorting to a biological test. Biological tests are of course necessary with individual cows in a small proportion of cases, but with practice and experience, the number of cases requiring a biological examination should be comparatively small. Biological examinations are also necessary in tracing tubercle infected milk supplies in herds where clinical symptoms of tuberculous mastitis are absent or indefinite and for control purposes. The biological test, of course, is rightly regarded as being the most delicate test available, but it would be wrong to assume that it is always infallible. Cases have been recorded where the biological test has failed to give a positive result, when tubercle bacilli have been found microscopically in a centrifugalised deposit, and where the presence of definite tuberculous lesions has been found in the udder on *post-mortem* examination.

Clinical Variations in the Udder as found on Examination, and their Interpretation

It cannot always be asserted that it is easy to decide definitely what is normal and what is abnormal, in carrying out a clinical examination, except, of course, in cases where a definite lesion exists. Many variations of a slight nature

are often noticed during clinical examination which are purely physiological in their origin, or due perhaps to methods of milking. The extreme development of cows for high milk yields has resulted in tremendous variations, not only in breeds of cows, but also in individual cases of the same breed and in the same herd. Whilst everyone probably has some general standard of the texture of normal udder tissue fixed in his mind, it is impossible to lay down a definite standard of normality which can be applied in every case. Every cow has its own individual peculiarities, and I am convinced that a comparison of each quarter is the only real and safe guide in deciding what is normal and what is abnormal in any particular udder. Naturally, one must except those cases where there is obvious abnormality affecting all four quarters. In discussing the method of examination, reference was made to the necessity for palpating the supramammary gland. The situation and relationship of this gland makes it difficult, if not impossible, to palpate the whole gland. Enlargement of this gland is frequently noted, but its condition cannot be regarded in my experience as being a very reliable aid to diagnosis. Enlargement of the gland, of course, is undoubtedly significant, and points to the necessity of careful manipulation of the corresponding quarter. It is not uncommon to find it enlarged in association with inflammatory conditions of the udder and also when there are septic infections present, such as, for example, in retained placenta. In a few cases of tuberculous mastitis enlargement and induration of the gland may be noted, but in a very considerable proportion of cases of tuberculous mastitis which have come under my notice, no abnormality of the gland could be noted on clinical examination, and no assistance in diagnosis was obtainable from its palpation.

The clinical variations in the udder itself can possibly most conveniently be dealt with under the heading of acute and chronic conditions. Sub-acute conditions, of course, occur, but from the standpoint of routine examination any such conditions can be conveniently included with the acute variations.

ACUTE VARIATIONS.

Acute inflammation of the udder (acute mastitis) is the only condition under this heading which need be referred to. The occurrence of general disturbance in conjunction with the local symptoms of congestion and enlargement of the affected quarter or quarters are sufficiently definite to allow of a diagnosis being made. The presence of pain, combined with the history of the suddenness of attack, the reddened condition of the skin of the quarter and the teat itself, leave little room for doubt as to the nature of the condition. The milk of the infected quarter becomes rapidly changed, with the formation of morbid secretion. Gangrene is not an uncommon sequel, and abscess formation also quite frequently occurs, with, in time, the complete destruction of the mammary tissue.

The possibility of a tuberculous lesion being super-imposed or being connected with an acute mastitis, must not be lost sight of. Attention is particularly directed to this occurrence by Matthews, and there seems no doubt that those cases of so-called acute tuberculous mastitis are definitely a mixed infection, where there is a combination of streptococci and tubercle bacilli.

Sub-acute inflammation of the udder need only be referred to briefly. The absence of constitutional disturbance, combined with local evidence of tenderness in manipulation, the appearance of clots in the milk, are sufficient to give an indication of the condition present, particularly if a microscopical examination of the milk has also been carried out.

CHRONIC VARIATIONS.

Variations of this type are by far the most frequent encountered during routine clinical examinations.

Induration.

Induration is primarily one of the most common chronic variations, and difficulty is often experienced in interpreting its significance purely on clinical grounds. It is impossible to type indurations on hard and fast lines, and in this way to draw conclusions definitely on the physical features of the induration, but a good deal of information will be obtained from a manipulation of the induration by the trained clinician, without the necessity of constantly resorting to milk sampling as an aid to diagnosis. The differential diagnosis associated with this condition does undoubtedly provide the clinician with a good deal of difficulty. In all cases of induration presenting features suggestive of tubercle, it is necessary to carry out a microscopical examination of the milk, and if necessary, to resort to a biological examination. This latter examination should not be required except in a small proportion of cases. In interpreting the significance of an induration present in the udder, consideration of all the factors observable in connection with the condition should be taken into account. The position of the induration in the udder or quarter should be noted. The relationship of the skin to the induration is important. When attachment is noted the condition is probably the result of injury, such as a horn gore or a tread. Scar formation should always be looked for in these

circumstances. The condition of the teat of the quarter showing induration should be carefully noted. Any appearance of thickening in the teat canal points to the condition possibly being the result of a previous attack of mastitis. With a tuberculous mastitis it is uncommon to find any thickening of the teat canal unless there is a chronic mastitis co-existing or preceding the development of tubercle. It is not uncommon to find induration apparently affecting the upper part of the hindquarter which is in reality due to an attack of mastitis affecting the mammary tissue in association with the supernumerary teats. Induration of this nature is flat and definitely circumscribed, and its nature is not difficult to determine.

The character of the induration is important. When the swelling is diffuse and the borders are ill-defined, giving a feel of increased solidity to the quarter affected, tubercle should always be suspected, especially if the milk secretion shows little variation from normal. In my opinion a sharply-defined border to the induration, especially if it is localised in a forequarter, points more particularly to the induration being due to a previous attack of mastitis rather than to tuberculosis. The surface of the induration should always be carefully palpated. Where the surface appears to be uniformly uneven, the induration should be definitely considered to be suggestive of tubercle. This unevenness which is referred to might be likened to the feel which one would get in running the fingers over a surface which is made up of a number of small convex discs. Reference has been made to the position of the induration as being of importance. In the great majority of cases of tuberculosis of the udder it is a hind quarter which is affected, and in the earlier stages it is the upper part of the udder which is affected. Indurations in this region should therefore always be regarded as significant of the presence of tuberculosis.

The area which is just in front or immediately behind the base of the teat in each quarter should be carefully examined. In primary tuberculous infection of the udder through the teat canal, which in my experience is rare, induration is found in the situation just mentioned.

The induration produced by the so-called actinomycosis of the udder gives an appearance very similar to that produced by tuberculosis. It appears impossible to differentiate on clinical examination between the induration produced by a so-called actinomycosis of the udder and that produced by tuberculosis. A bacteriological examination of the milk is necessary, and tuberculosis must be eliminated before any conclusions can be drawn as to the presence of this udder condition.

Atrophy.

Loss of function and atrophy of a quarter or quarters is a common sequel of an attack of mastitis. Tuberculosis only rarely develops, in my experience, in the completely atrophied quarter which has resulted from an acute attack of mastitis. Cases of tuberculous infection do, however, occur in the partially atrophied quarter, where loss of function is not apparently complete. During routine examination, palpation of an atrophied quarter for the presence of induration should not be omitted.

Hypertrophy.

Where atrophy of one or more quarters has occurred, it is not unusual to find an increase in size of the remaining functioning quarters. Such a variation has no pathological significance, and appears to be merely of a compensatory nature.

Enlargement of the quarter does, however, occur in tuberculous infection of the udder, but it is always definitely associated with other characteristics. Occasionally in old cows, uniform enlargement of the whole udder is found. This enlargement may increase to such an extent that the udder drops down until the teats are within a short distance of the ground. In these cases there appears to be a distinct space between the mammary tissue and the abdominal surface. In such udders it is not uncommon to get a uniform hard feeling, which, however, does not amount to actual induration. In such cases palpation is exceedingly difficult and somewhat unreliable.

Œdema.

This is a normal physical condition at the time of parturition. It generally persists for some little time after parturition. Its presence in newly-calved cows makes it almost impossible to carry out any reliable clinical examination of the udder. The condition is often deliberately intensified by the practice of overstocking cows which are offered for sale. Attempts are often made in this way by dealers to hide defective quarters. Not infrequently, the œdema occurring at parturition may persist, especially in the lower posterior surface of the hind quarters, for as much as two or three weeks. Its presence should not be confused with actual induration.

Abscess Formation and Pus in the Udder Tissue.

These are conditions definitely associated with mastitis, and are not tuberculous in origin. The possibility of the co-existence of a tuberculous lesion in such circumstances should not be overlooked. I have on several occasions found tubercle present in quarters which contained pus. These cases, of course, were definitely of a mixed infection, which are probably much more common than is generally recognised.

Tumours in the Udder.

Tumour formation in the cow's udder is exceedingly uncommon, if the common papillomata are excepted. In the course of making many *post-mortem* examinations of cows, I have not come across evidence of the presence of any tumours in the udder of a malignant type. It is not uncommon, however, to meet with small tumours, apparently of a fibrous nature, affecting the udder. These generally do not exceed the size of a bantam's egg, and are generally situated superficially. They are fairly movable, and not apparently attached to the skin, and they do not appear to involve the mammary tissue itself. These tumours have relatively little significance, and do not affect the full functioning of the quarter.

Tuberculous Mastitis.

Repeated reference has been made to the occurrence of this condition whilst dealing with the clinical variations which are encountered during routine examination. Obviously, routine examinations are directed chiefly to the discovery of this condition, owing to its primary importance in relation to the infection of milk. In my experience, text-book descriptions of this condition have been of very little assistance in routine clinical diagnosis. The well-developed typical lesion affecting, most usually, a hind-quarter, and resulting in progressive and definite induration which is painless and hard like a stone, presents little difficulty in diagnosis. Even in such cases, verification of the diagnosis should always be made by a microscopical examination of the milk. One's experience, however, is that this type of case is less common in my district now than was formerly the case, due possibly to the effects of routine examination, bulk sampling and more prompt action being taken by owners to report abnormalities of the udder. It is more common in my district, at any rate now, to be faced with cases of tuberculous mastitis where the disease is in a relatively early stage. Consideration of all the evidence which can be derived from a physical examination of the lesion, with a microscopical examination of the secretion of the affected quarter, will, in the great majority of cases, enable the experienced clinician to differentiate between tuberculous mastitis and other conditions similar to it without the necessity of continually resorting to biological examinations. On no occasion, if the lesion is suggestive of tubercle, should the cow be passed over without taking a sample of milk for microscopic examination. Such a precaution is necessary in the interests of public health.

The so-called nodular form of tuberculous mastitis is rare, in my experience, and this, of course, is only natural if we accept the lymphatic theory of infection of the udder to account for the majority of cases of tubercle infection of the udder, except when there is evidence of direct infection of the udder through the teats.

In the early stages of the disease the indurated areas are comparatively small and deeply imbedded in the mammary tissue, and a cursory palpation will not detect these. Too much insistence, therefore, cannot be placed on the need for careful and thorough examination.

Cases Where Tubercle Bacilli are Eliminated in the Milk Without Any Clinically Recognisable Lesion in the Udder.

It is difficult to give any estimate of the time which elapses between the original infection of the udder and the development of clinical lesions. There undoubtedly does exist a pre-clinical stage when tubercle bacilli are being eliminated in the milk. The duration of this stage is variable, but from experience obtained in tracing tubercle infection of milk, this period may definitely be at least three months, and may, possibly, in isolated cases, be even longer. Routine clinical examination will fail in this stage to detect the presence of infection of the udder, but the value of such examinations is not to be discredited on this account, when one has regard to the numerous cases which are detected by the experienced clinician in relatively early stages which would otherwise go on producing tuberculous milk for long periods without being recognised or reported by owners. Competent clinical examination, supplemented by microscopical methods, will undoubtedly lead to the detection of most cases of tuberculous mastitis.

The pre-clinical stage of tuberculous infection of the udder must, however, be recognised, and it is for that reason that I have consistently been of the opinion that a reasonable amount of bulk sampling is a necessary adjunct to clinical examinations for the purpose of assisting in the elimination of tubercle infected milk, and further, that the present-day tendency to deal with milk supplies at large depôts and collecting stations makes it necessary for such sampling to be carried out in the producing areas before bulking takes place, if there is to be any reasonable assurance of the effective and rapid tracing of the source of infection.

References.

Begg. "Hoare's System of Veterinary Medicine," Vol. i, page 374, *et seq.*

Annual Report of the Chief Veterinary Officer for the County of Nottingham—1930-31.

Annual Report of the Chief Veterinary Officer for the City of Liverpool—1931.

Matthews. *Veterinary Record.* Vol. x, page 381.

Matthews. *Veterinary Record.* Vol. xi, page 403.

Discussion

The third and final session of the Veterinary Medicine and Surgery Section was held at the Town Hall, Folkestone, on the morning of Friday, August 12th, 1932, when Major D. S. Rabagliati (Wakefield) presided over a large company.

The Chairman announced that Captain R. Simpson (Carlisle), the author of the paper they were assembled to discuss, desired to make a few introductory remarks.

Captain R. Simpson (Carlisle) said:—

I do not propose to occupy more than a few minutes in introducing my paper for discussion. It has been circulated and there has been ample opportunity for the preparation of criticism and discussion on the subject.

When the Provisional Committee allotted this subject to me, it was defined by them as "The Differential Diagnosis of Conditions met with on Clinical Examination of the Udder." This was obviously a wide subject, about which much might have been written, and I have taken the word "clinical" as the keynote of the paper, and endeavoured to comprise within suitable limits a study of the subject from that angle.

A large section of the paper is devoted to methods of examination, and I make no apology for having done so; in particular, I have stressed the need for thoroughness in examination if our work is to give satisfactory results. In view of the nature of my ordinary duties, tuberculous mastitis has naturally been in the forefront of one's thoughts, possibly leading to the exclusion from the paper of a more detailed reference to other udder abnormalities, but I hope the discussion will fill in some of those omissions.

My reference to clinical actinomycosis of the udder is short, mainly for the reason that I seldom encounter cases of this nature. The incidence of clinical actinomycosis generally in my district, is comparatively slight. It would be interesting to know from those taking part in the discussion, to what extent this condition is prevalent in other districts. Cases which I have met have presented features indistinguishable on clinical grounds from the induration associated with mastitis and tuberculosis of the udder. Since writing my paper, my attention has been drawn to an excellent article on this subject in the *Australian Veterinary Journal* by Albiston. He states that the condition is comparatively common in Victoria and that the typical clinical feature is a feeling of nodules in the udder, giving a "shotted" feeling to the fingers. Out of 46 udders diagnosed on clinical grounds as being affected with actinomycosis, 20 were found to be affected with other pathological conditions; the remaining 26 were definitely showing the characteristic histology of actinomycosis on microscopic examination. I have not come across this "shotted" condition said to be associated with clinical actinomycosis of the udder in Australia.

I should have liked to have found space in my paper for some reference to the question of the age of the lesions as judged on clinical grounds and mainly with reference to the legal point of view. This is a matter of considerable interest, and certainly of importance, and possibly some of the discussion may include reference to this aspect of the subject.

In general, the value of routine clinical examinations of the udder has received considerable prominence lately. Attempts are repeatedly made by persons to discredit its value and to advocate other means to protect the milk consumer. Much of that criticism is based on a lack of knowledge of our methods and general misconception. Certainly it must be admitted that the value of clinical examinations generally is in proportion to the skill and thoroughness with which the work is carried out. In the latter part of my paper I have indicated my opinion of the folly of placing all our eggs in one basket. Clinical examination of the udder is part of the general scheme of preventive methods in connection with the control of tuberculosis, but essentially, it is one of the main weapons in our hands. It is idle to compare the relative values of clinical examinations and bulk sampling, for example. Each is complementary to the other, and both, in my opinion, are necessary in the campaign against human infection with bovine tuberculosis and the control of this condition generally.

I hope that the material provided in the paper, inadequate as it may be, will provide scope for discussion, and assist in solving some of our difficulties in this most important aspect of veterinary practice.

The discussion was opened by Mr. Thomas Wilson, m.r.c.v.s. (Nantwich), who said:—

In the first place, I should like to say how much I appreciate the honour of being asked to open the discussion on this subject—one which is just as important to the general practitioner as to the whole-time veterinary inspector.

Captain Simpson has given a very thorough and lucid description of the methods to be adopted in the examination of cows for the different pathological conditions which one has especially to look for when making a clinical examination of their udders, and I congratulate him on the excellent paper he has prepared for discussion.

I agree with most of his observations, but not all, and therefore any criticism I have to offer will be more of a constructive than of a destructive nature. He has dealt with the subject almost entirely from a public health aspect, to which I have very little to add, and most of

my remarks will be from the general practitioner's point of view.

Method of Examination.—"Routine inspection is tedious and it involves considerable physical effort." I think it is most important when making this clinical examination, to concentrate one's mind on the "feel" of the udder—I do not consider it so much a physical effort as one of mental concentration—and after one has had a fair amount of experience in examining cows' udders, one gets to know that directly the hand touches a certain udder it requires little more examining, and one is satisfied with the first impression that it is a normal, healthy udder; whilst in others, directly one feels it the impression is conveyed to the examiner that a more thorough examination of this case is required.

Stenosis of the teat is referred to as producing some swelling of the quarter involved. This swelling usually takes the form of a ballooning of the teat sinus. The same condition is met with in cows which are easy to milk; it commonly appears in later life; also quite often in young cows and heifers. It is, however, of no consequence (non-pathological), and is often referred to as "windy pap."

Examination of Supramammary Gland.—The essayist mentions that when difficulty is experienced in palpating these glands, movement of the hind leg outwards and forwards often facilitates the examination by making the glands more accessible to the fingers. I do not quite follow him here: does he mean that one should make the cow put her hind leg in this position herself or that you should get a man to lift the leg and try to hold it in position? This may sound all right in theory and on paper, but I certainly should not like to try it in practice nor ask anyone else to do so, for very obvious reasons. If these glands cannot be felt when the cow is made to move her hind legs apart—and there are many in which they cannot—why trouble further? If the gland is enlarged, I agree it calls for a more careful examination of the corresponding quarter, and I also agree with the writer that "its condition cannot be regarded as being a very reliable aid to diagnosis." Enlargement of a supramammary gland, without any clinical symptoms of a tuberculous udder is, in my experience, very seldom due to tuberculosis; in fact, I think in nearly all cases where I have found an enlarged supramammary gland, with an apparently normal udder, and taken a milk sample for microscopic and biological tests for tuberculosis, that it has proved negative. I have no doubt there are cases in which one gets an enlarged supramammary gland due to tuberculosis, but the vast majority of enlargements of this gland are not due to tuberculosis.

Captain Simpson emphasises the necessity of examining the udder when it is empty, or nearly so: there is no doubt that to make a thorough examination to decide the nature of most pathological lesions it is imperative that the udder be emptied; especially so is this the case in examining for tuberculous lesions.

A microscopic examination, I agree, is a most useful help in clearing up an indefinite pathological lesion, as to whether it is tuberculous or not. I do not consider a microscopic examination is always essential for the diagnosis of a tuberculous lesion—a great many can be definitely diagnosed by a clinical examination alone, especially if lesions of tuberculosis are present elsewhere (which they are in nine cases out of ten) and therefore I consider a general examination of the animal in cases of tuberculous mastitis is of great assistance.

There is one condition to which the essayist does not refer, unless he includes it amongst mixed infections of tuberculosis, in which there is a certain amount of œdema and heat and other acute symptoms not considered typical for tuberculosis and which I believe by most writers are considered to be mixed infections. The condition I mean, however, is an acute tuberculous mastitis caused solely by tubercle bacilli invasion, with heat, pain, etc., in which the milk is rapidly changed from normal to the characteristic whey-like fluid one gets in the later stages. In these cases the milk is simply teeming with tubercle bacilli, although the history and clinical symptoms are not the usual classical ones of tuberculosis, excepting, perhaps, that the cow is badly affected in other parts of the body.

Another important factor in examining cows' udders for tuberculosis (apart from enquiry into the history of the cases, and especially in those cases where tubercle bacilli are eliminated in the milk and no animal in the herd can be found after a careful clinical examination to be exhibiting symptoms of tuberculous mastitis) is to take the owner into one's confidence and ask him which animal he suspects. He usually suspects none, but on a few occasions I have known him pick out an animal with an apparently healthy udder, and when a sample of the milk has been taken and examined microscopically or biologically, to be found to be the source of the contamination.

At this point I should like to ask Captain Simpson's opinion on the following case: A cow has been found by the biological test to be passing tubercle bacilli in her milk and is dealt with under the Tuberculosis Order. *Post-mortem* reveals no macroscopic lesions of tubercle in the udder or elsewhere, the carcass being, as far as one can see, entirely free from tuberculosis. Should the veterinary inspector give the owner a certificate to the affect that she is free from tuberculosis, entitling him to

£1 more than the animal was valued at, or before doing so, ought he to submit material to a laboratory for further examination?

Acute Variations.—Captain Simpson has dealt with these conditions in a very perfunctory manner, as the lesions prescribed are so definite and pronounced and obviously are not due to tuberculosis. Moreover, from a public health point of view, they are not of so much importance. I should like to discuss these cases, however, more from the general practitioner's point of view.

In these cases clinical examination is much more important than a microscopic one, as we have to begin treatment and give advice at once; also, from the clinical symptoms presented one can generally get a fairly accurate presumption of the type of mastitis one is dealing with, by taking into consideration method of infection, injuries to teats, use of probes, lactation period and time of year, etc.

What are the chief symptoms and conditions to examine for, so that we may form a prognosis and give our clients the best advice? Here the condition of the udder is of secondary importance: the owner knows the cow will lose the affected quarter (or quarters) of the udder. The question is, can we save the cow and is she likely to be of further use as a milker, be kept and bred from, or should she be fattened (*i.e.*, after recovery) and sold for beef or, if fat and in good condition, slaughtered immediately to prevent further loss?

The clinical symptoms exhibited by the udder in these acute cases are seldom sufficient to enable us to give a definite answer to these questions, and therefore this local examination must be combined with a general examination of the animal and the prognosis based on the symptoms and lesions presented elsewhere.

I hardly know whether a discussion on these general symptoms comes within the scope of this paper, but I think I might mention a few of the general symptoms for which one looks.

Appetite for Food.—This I consider to be one of the most important guides in forming an opinion. No matter how high the temperature or feeble the pulse, if she has an appetite for food it is a most favourable symptom for an ultimate recovery, but if all food is refused, especially in cows of a heavy phlegmatic nature, even if the symptoms in the udder do not appear to be very severe or acute, the case must always be considered very grave and recovery very doubtful.

Pulse.—Irregularity of the heart and rapid pulse are also unfavourable symptoms.

Temperature.—This is not a great guide at the onset of an udder infection, as it is not an indication as to the course or severity of the attack, and can only be considered in conjunction with the general symptoms presented.

A sub-normal temperature must always be considered grave.

Position and Attitude of the Cow.—This should always be noted in these cases. If the animals are not inclined to move about much, but remain in one position for a considerable time, and if, once they go down they are very difficult to get up or refuse to do so entirely, these cases are generally fatal.

Constipation in the early stages is a common symptom and often favourable. Diarrhœa at the commencement of an attack is much more serious and unfavourable and often accompanied by loss of appetite.

Lameness and stiffness in one or more legs is often present; in some cases before anything is noticed in the udder, but very commonly as a secondary condition. Here the joints and synovial sheaths are tender and swollen, the pain is often very severe and after the acute symptoms have subsided in the udder a form of chronic arthritis persists, in some cases for several months, preventing the animal from fattening.

The local lesions are briefly described by Captain Simpson, but I do not think I have anything to add to what he says. I agree with him that an acute mastitis may be followed by a tuberculous infection, but I do not agree, as I have already stated, that there is no such condition as an acute tuberculous mastitis as quoted by Matthews. This perhaps is only a technical point of not much importance, but it does emphasise the usefulness of the microscope in determining whether tubercle bacilli are present in the milk or not.

Sub-acute inflammations of the udder are only referred to briefly and as of not much importance, from a public health point of view, but from the practitioner's point of view, and more especially in the stock owner's interest, they are most important, as the economic losses are greater from some types of these affections than all other diseases of the udder combined. I will refer to one type later.

Chronic Variations.—These have been very fully dealt with by the essayist and I have little or nothing to add to his remarks.

An induration following a septic mastitis is practically always associated with an atrophying of the affected quarter, unless a tuberculous infection takes place, in which one again gets a gradual hard enlargement of the quarter.

I know no condition in which this gradual persistent increase in size of an induration, unaccompanied by heat or pain, is due to any cause other than tuberculosis. Cases of tuberculous induration of the quarter, accompanied by atrophy of the quarter are, I think, very rare and difficult to imagine. I have not yet found one, but one occasionally meets with a case in

which the atrophied quarter—following a non-tuberculous mastitis—gradually increases in size, again due to tuberculous infection.

Actinomycosis.—Induration caused by the " ray fungus " is, I believe, now discounted, and the cause of the so-called actinomycosis attributed to staphylococci.

Reverting to sub-acute inflammation, there is one type of mastitis to which I should like to refer, *i.e.*, the contagious streptococcic mastitis which, although of a mild sub-acute nature to begin with, always assumes a chronic form. Although there may be many forms of mastitis which might be considered to come under the category of being contagious, in practice I think this is the only type which really assumes an enzootic form and shows evidence of its contagiousness.

The clinical symptoms in most cases are very mild, and little or no change is shown in the affected quarter. There is practically no heat or pain or enlargement of the quarter; in fact, in the majority of cases nothing can be found wrong with the udder, in spite of a most careful and thorough manipulation of the gland, and it is only when one draws a little of the milk into the hand or on to a black, smooth surface, or passes it through a fine sieve, that the affected animals can be detected, by the presence of small, curd-like flakes in the milk, and in some cases (in fact, in a great many in the very early stage) one will not be able to detect these flakes in the first milk drawn.

After the first few squirts of milk the remaining milk shows no naked-eye abnormalities. Brom-cresol purple papers may be used to test the milk, but are not satisfactory: the deeper blue coloration which these papers show with this milk one also gets quite commonly in cows during the drying off process and whose udders are quite healthy.

In the diagnosis of this condition the *history* is the all-important factor. The milk develops a taint; it has a very bitter taste, the taint remaining on the palate for an hour or so afterwards; the milk does not keep, but sours rapidly. The milker may notice that the filter wads through which the milk is first sieved soon become covered with a slimy deposit, preventing the milk passing through as quickly as it should and necessitating the use of fresh filter wads.

In the case of a graded herd, the notice of its being affected may first be brought to the owner by the fact that the bacterial count is much too high, and in spite of all precautions taken to produce clean milk his bacterial count, especially as regards *Bacillus coli*, remains much too high. (In Cheshire this condition is one which has become very serious and is a great menace to producers of graded milk.)

In the case of the cheese maker, the fact that he has this complaint amongst his stock will first be brought to his notice during the process of making the cheese, or it may be that he has been in the habit of successfully exhibiting cheese at shows and taking prizes, finds he is no longer successful, and is at a loss to understand why the cheese does not come up to his usual high standard.

A slight odour is first noticed coming up during the cooking process in the cheese making —about two to three hours after the milk is put in the vat; it is also noticed in the evening's milk next morning, *i.e.*, about 12 hours afterwards. This taint is variously described as " fishy odour," "pine-apple odour," or "exaggerated cheese odour." The curd will not firm up, and there is a lack in body or consistency due to the functioning of the lactic acid organisms being interfered with in some way, and increased alkalinity of the milk.

If only one cow in a herd is affected the flakes in the first milk from this cow will often be detected in the filter pad from the whole of the mixed milk. The cheese retains this fishy or pine-apple flavour even after ripening: it remains too moist and is said not to keep well.

It is therefore fairly obvious that this form of mastitis, once it gains entrance to a stock, is a source of very considerable economic loss; it is extremely difficult to eliminate, and although one may only have a few animals affected in a herd it is quite common to get 60 per cent. or more affected, especially where milking machines are used. The clinical symptoms being so mild, make it very difficult or impossible to pick out all the affected animals and in some cases one has to resort to bacterial counts of group samples to find out the offenders, and even this is not satisfactory.

I have dwelt rather lengthily with this type of mastitis because I consider it is one which is very much on the increase (or it may be that owing to the greater care taken in clean milk production it is brought to our notice more), especially in some parts of the country. The losses caused by it are, I consider, greater from an economic point of view than those from all other forms of mastitis combined, and in many cases the loss to the stock owner caused by it can be ranked alongside of that caused by contagious abortion, as not only is there the loss of milk from the cows detected to be suffering from this disease, etc., but there is almost invariably a diminished milk yield during the next lactation period, and one attack of the disease does not convey any immunity against another; in fact, it is the reverse.

In conclusion, I would just like to mention examination of cows' udders for complaints regarding disconformity of warranty of soundness or correctness.

This subject has recently been engaging the attention of some of the veterinary societies in

Scotland, with a view to forming a code of rules and conditions which might be adopted universally, but as I am not aware of any conditions being laid down, I will just mention a few of what I consider to be the common abnormalities that we are often asked an opinion about. Moreover, I think it is a subject which comes within the scope of this paper and should evoke a good discussion which will be helpful in coming to an agreement as to what constitutes unsoundness or incorrectness of udder.

(1) Any induration or pathological lesion causing a destruction of the gland tissue.

(2) Stenosis of the teat duct, or any condition interfering with the flow of milk—also the reverse condition, in which the milk cannot be retained for the normal period, due to incompetence of the teat sphincters, lacteal fistulæ. Fibrous nodules or " peas " in the teat would come under this category of interfering with the flow of milk, but it is very common to get these fibrous " thickenings " in the cow's teat, which do not appear to interfere in the slightest with the flow of milk and in my opinion these should not constitute unsoundness or incorrectness of udder, *i.e.,* when not interfering with normal flow of milk.

(3) Lightness of a quarter. This is often difficult to decide, especially as we have no rule laid down stating definitely what constitutes lightness of a quarter. If the lightness is due to atrophy of the quarter following disease it is easily disposed of, but when no abnormality can be detected in the quarter in question it resolves itself into a question purely of milk yield.

I have a fairly open mind on this subject, but I do not consider it fair to compare hind-quarters with fore ones, but that the estimate should be made by a comparison with its fellow on the opposite side. I consider that when the yield from any one quarter is only half or less than that of its fellow on the opposite side it should constitute lightness of a quarter and therefore a breach of warranty if sold sound or correct in udder.

Some farmers and others with whom I have discussed this subject consider that three-quarters of the yield from one quarter, compared with its neighbour, should be the standard laid down, but it is for us to discuss thoroughly and put forward some data on which a universal code of rules and regulations may be finally arrived at for future guidance in this matter.

I am afraid my notes in this discussion have been rather disconnected, but I think I can claim to have introduced some important points of controversy which provide material for a lively and beneficial discussion, which we all enjoy.

Mr Hugh Begg (Hamilton) said that it had been his intention to leave that discussion entirely to the younger men, but perhaps they would regard it as a little unbecoming if he did not have something to say in recognition of a paper produced by his former pupil. He thought that perhaps it was also both competent and becoming that a Scotsman should acknowledge the feather placed in Scotland's cap by Captain Simpson and state the position in regard to the quality of the work that they did in the north country. Indeed, he felt very sorry for the men in the South, who were in many areas getting no opportunity at all of exercising the powers of existing legislation that had been designed for the benefit of the herd owner.

He thought it was a little unfortunate that any attempt should be made to side-track the subject under discussion into a channel that was not intended. His interpretation of the paper that had been written by Captain Simpson was that he had dealt with his subject from the public health standpoint; Mr. Wilson had dissertated on mastitis—he (Mr. Begg) did not know to what extent, if any, they were going to limit consideration of that matter. His view was that if they were going to deal with mastitis at all, it should be to try and determine to what extent the milk of a cow suffering from the various forms of mastitis was to be excluded from consumption: when one quarter was affected, at what stage were they going to allow the product of the other three quarters to come into general use? In Lanarkshire they took samples from every abnormal quarter in order to see what type of organism was responsible, and they had put them all through the guinea-pig.

The vexed question of mixed infections was rather intriguing: Captain Simpson had dealt with it and Mr. Matthews, of Liverpool, was greatly interested in it. He could not lend much support to their view that mixed infections were of frequent occurrence; one met with an odd case here and there, but it was not a common thing to find the *Bacillus tuberculosis* and other pathogenic organisms present in the same sample. He had never yet seen a painful case of tuberculosis of the udder, and when Captain Simpson said that a tuberculous udder felt like a stone, he did not agree with him: a stone was incompressible, but a tuberculous udder lesion felt more like vulcanised rubber set under the loose skin. As soon as the condition was advanced one got uniform firmness and induration, but even then it was compressible.

Perhaps Captain Simpson would permit him to tell him that, in dealing with the numbers of tubercle bacilli in the fore, mid and after milk, he had been reading wrongly a page of Wallis Hoare's book where he (Mr. Begg) had written the results of some research work. He

had found that it was the middle milk which contained tubercle bacilli in the greatest numbers, and not the strippings.

Captain Simpson laid great stress on the clinical examination of the udder. He said: "There can be no question that the examination of the udder is greatly facilitated if the cow is milked out . . . . In my view, examinations which are carried out on a routine basis within an hour or so of the time of milking are not conducive to accurate clinical work." He (Mr. Begg) had never seen his way to encourage the routine inspection of cattle in the summer time on that ground: it was not worth while. He could never be sure that he had made a good examination of a dairy herd if the animals were in with turgid udders and had not been milked.

The essayist had expressed the view that the taking of bulk samples of milk was a very important matter in the detection of tubercle bacilli. The question arose whether a man should devote his time to a more often repeated clinical examination, or go out taking bulk samples of milk for microscopical examination? He voted for clinical examination every time: he had seen twenty-eight guinea-pigs annihilated, and no result whatsoever obtained.

He did not know why Captain Simpson asserted that the man who makes the clinical examination should also do the microscopical examination: that hit him deeply, because he never did the latter. He had the greatest faith in the county laboratory people, and he regarded it as of great importance that a neutral man should give one the opinion regarding milk samples.

With regard to actinomycosis of the udder, he had never seen it.

Mr. P. F. Dolan (Dublin) thought it would be of interest if he gave them a few remarks on the routine system adopted in their area.

Each veterinary officer carried out his own microscopical examinations, and the biological examinations also were carried out in the veterinary department.

Any remarks he had to make would refer particularly to the small lesion in the udder: he regarded it as easy to diagnose, by microscopical examination, the tuberculous udder that was markedly indurated, but for those who carried out large numbers of examinations the great trouble was diagnosis of the small, early lesion, and in some cases the diagnosis of lesions in udders that one would not usually suspect of being tuberculous. Hundreds of cases were handled in which it was difficult to eliminate the non-tuberculous udders. They would examine a large number of them microscopically and they possibly would prove negative; group samples (six to a group) were then taken and inoculated into guinea-pigs, and if the result was again negative, then those cows were not giving tuberculous milk; if positive, then they knew that at least one cow of a group was giving tuberculous milk. They would apply the tuberculin test to those cows and, with luck, they might get only two reactors: possibly they might get the whole six reacting. If they got two or three reacting and the remainder non-reactors, they had at least cut the six possibles down to two or three, and if they again failed on microscopical examination they would do a biological examination in each case.

That was roughly the routine examination in their area as regarded the very early and small lesions, and those cases that were hard to diagnose otherwise.

Concerning the supramammary lymphatic glands, except in a certain number of cases, he found that that gland was of very little service in helping him to arrive at a diagnosis.

He had some figures that might be of interest to the members: details of *post-mortem* examinations on 32,000 cows in one slaughterhouse over a period of six years. Out of these, 10,000 were found tuberculous, 303 were found to be affected with tuberculosis of the udder and 168 of these showed no lesion in the supramammary lymphatic gland. Of the 10,000, 273 showed lesions in that gland and in 138 of these there were no macroscopical lesions in the udder. He thought those figures were of interest in connection with the supramammary lymphatic gland. (Hear, hear.) They were not much use, however, for the purposes of percentages, because a large number of those cows were slaughtered under the Bovine Tuberculosis Order and that would increase the percentage. In addition, he took a note of the age of those cows, and 5,000 of them were between 11 and 15 years of age, so his percentage would not be a true percentage of all the cows in the country.

As regards the question of acute tuberculous mastitis, there was such a condition, and anyone who would not pay attention to the question would, at some time or another, miss a tuberculous udder. He would describe one case—a cow with a typical non-tuberculous mastitis, which showed great enlargement and which one would pass by and say "that is streptococcal mastitis." On examination of the secretion of this cow's udder, it was watery, and tubercle bacilli could be got from the sample without centrifugalisation. A point in connection with these cases was that they were usually fatal in a few days.

They found the tuberculin test of some service in arriving at their conclusions as to the condition of the udder. One was an official and a cow was reported as having an indurated udder. One took a sample of the secretion and either examined it oneself or sent it away. The

result was " sample negative," but one still had a suspicion and sent the sample forward for biological examination. If the result were received in six or seven weeks one was lucky, and during all that time the milk was lost: a serious matter to the farmer if the cow was a big milker. He contended, therefore, that it was the duty of the veterinary officer to test that cow before he sent the sample for biological examination: he could then get some result in 24 hours; the cow might not be a reactor to the tuberculin test and the owner might be saved the whole six weeks of isolation.

Mr. Hugh P. Hogben (Folkestone) observed that he was gratified at the invitation given by Mr. Begg to those of other parts of the country to say how they carried out the clinical examination of the cow's udder, and he had especially mentioned the difficulty of making a satisfactory examination when the udder was in a turgid condition. He (Mr. Hogben) would give his method of examination in an endeavour to get round that difficulty. In any cases where he had been called in to examine dairy herds under the Tuberculosis Order, or under the Dairies Order (in which case in that district they acted in conjunction with the M.O.H.) he had always made it a practice to arrange for the cows to be milked and for the milkers to let him know when they had come to the " strippings " and he would examine the udder, leaving the strippings for the milk sample if required.

If one was to make a really efficient examination of the udder he thought it must be done in some such kind of way. At any rate, that was the way practised in his district in that part of the country.

Mr. Harold Burrow (Birkenhead) desired to ask one or two questions, for he felt that, having such an authority there, they should make the best use that they could of the opportunity.

He desired to confirm what Captain Simpson had said—that to examine a herd of cows which were not even milked out dry was almost useless: if a case of tuberculosis was found in a cow half full of milk, that case should have been spotted some months before.

No mention had been made by Captain Simpson of two conditions, *viz.*, cowpox and the so-called false cowpox. How would the essayist deal with cases of these conditions? He (Mr. Burrow) met with a number of outbreaks of cowpox in which quite one-third of the herd were affected. They did not know whether to stop the milk of one-third of the herd and deprive the owner of that proportion of his livelihood, or what procedure to adopt.

A point which he had noticed in the examination of positive tuberculous milk was that when one took a sample and the bottle was about one-third full, and one shook it, fine, pin-point flecks would appear on the sides of the bottle as the milk flowed down. He had observed that in every case in which he eventually got bacilli on microscopical examination. Moreover, a tuberculous smear would dry more rapidly than a non-tuberculous one; and the smear would show a somewhat more pronounced pastel shade of blue than would a non-tuberculous sample.

He also desired to ask if they were justified in carrying out any serious examination of cattle at auction markets, in view of the fact that under these circumstances they were invariably stocked up for sale? In his view, they should protect themselves by working out some pronouncement that they did not accept responsibility for the examination of cows at sales where stocking was the custom.

In regard to grade A herds, he would like to ask Captain Simpson what line of demarcation he adopted in the case of three quarter cows. He (Mr. Burrow) was of opinion that every animal in a grade A herd should have a perfectly normal udder, and that no cow that had lost one quarter entirely should, as was now often the case, be allowed to remain in such a herd.

Where they were examining a herd which they knew was giving tuberculous milk—say they were examining 30 cows, and they found six with induration of the udder which they did not care to leave unsampled, were they justified in stopping the milk of those six cows for a matter of four to six weeks, or did Captain Simpson think that if those six samples were examined microscopically either by the veterinary surgeon himself or by a bacteriologist and negative results were obtained in any case, that one was justified in allowing the milk from the cow concerned to be used, pending the result of the biological examination? After all, the fault really lay with the profession—in that it took so long to diagnose the case—and it was hardly right that the owner should be penalised for the shortcomings of science.

He wondered if the essayist thought that in all those cases of induration of the udder with which they met, where there was no history and where they were certain that there had been no outbreak of mastitis, that induration might have an origin in the *Brucella abortus* which, as they were told, found a nesting place in the udder between the periods of gestation?

Mr. F. L. Gooch (Stamford) said that he should like to take that opportunity of thanking Captain Simpson for bringing before them a subject which was more than interesting, and the consideration of which he wanted to be instructive to him, as an inspector of dairy cows. It was almost an impossibility to carry out a proper inspection of a cow's udder unless the milk had been extracted. That could nearly

always be done by visiting almost immediately after milking time in the morning.

It was important to keep on good terms with one's client if one wanted information, and it was a mistake to upset the routine of the farm if that could be avoided. (Hear, hear.) He always sent a post-card advising his visit and giving the approximate time, at least two days before the visit.

He usually found it difficult to detect tuberculosis of the udder in its early stages. One of the things upon which he laid most stress was a rough surface, as mentioned by the essayist: a tuberculous udder often presented a surface of the peculiar nature found on a warty growth.

He never relied entirely upon his own microscopical examination of the milk, for more than one reason. One particular reason was the importance of giving satisfaction to one's local authority and to the owner concerned. They might content themselves with the knowledge that they had done—as he had done—hundreds of examinations of milk under the microscope, but it was not easy to find the tubercle bacillus. He had examined six samples from a tuberculous udder without finding one tubercle bacillus in any field until he reached the seventh. That more particularly was the case since they had had so much bulk sampling. They got many dairies sending their milk to the same station; a bulk sample was taken at the dairy on arrival and found to be affected and the local authority was informed that milk arriving from a certain station was tuberculous. On three occasions recently he had been sent to the wrong dairy because of the bulking.

He quite agreed with many other speakers that there was not very much information learned from examination of the supra-mammary gland alone. He was very pleased to hear one of the speakers say that he found tubercle bacilli in the milk from the affected quarter in a case of acute mastitis. He had often wondered whether, in many instances, the presence of the tubercle bacillus in the affected gland was not sometimes the origin of the mastitis.

He could not agree with Mr. Dolan when he said that he always tested the cow before sending a sample away for microscopical examination. He thought that if they could not get a proper result from the examination of the milk they should not test before sending the milk and having the reply back from the research laboratory. At the same time, he did attach great importance to testing, and he should not admit to the herd a cow that he thought had tuberculosis, even though an examination of the milk proved negative, unless he had tested her.

One of the speakers had said that he was in doubt whether he was justified in keeping out of the herd six cows found on examination for tuberculosis of the udder, to have indurated glands. He (Mr. Gooch) thought he would be perfectly justified. If he did not, how was he going to answer the question, which cows was he going to keep out of the dairy herd and which was he going to keep in?

As regarded cowpox, there he thought they could not be too strict. If he had twenty cows in one herd that were suffering from cowpox he should not use the milk from any one of them for human consumption: they must realise, in such a case, that they were dealing with a disease contagious to human beings.

The last speaker had drawn attention to the flecks upon the bottle after shaking; he thought that, if he would examine them, he would find that they were merely cream spots.

Mr. J. N. Ritchie (Edinburgh) drew attention to the following statement on page 3 of Captain Simpson's paper, *viz.*: " With increasing knowledge and confidence in appraising the significance of the various udder conditions met with, the amount of sampling can be definitely curtailed." He (Mr. Ritchie) was afraid that, although he had not had a very long experience, he could not agree with that statement. He found that he met with a great number of udder conditions which were very indefinite and yet which were sufficiently abnormal to warrant a sample being taken. In that connection, it was very necessary that a veterinary officer who was examining the udder should do his own microscopical work, because when he took his sample and centrifugalised it, the character of the deposit which he himself saw had a certain amount of significance. If he did his own microscopic work the veterinary inspector saw the whole picture: the clinical appearance, the milk, the deposit, the cell content, etc., and could more easily arrive at a diagnosis. Several samples only required to be centrifugalised and discarded as negative.

The previous speaker had mentioned the question of biological testing as a corollary to the clinical examination of cows. He (Mr. Ritchie) thought that Captain Simpson stated that that was a very necessary adjunct to their clinical work, but one speaker was not so sure of that. He should like to mention two cases which he thought justified the biological test in this connection. One was in connection with a bulk sample taken in July last year; there were only 12 cows in the dairy and nothing suspicious was found. Group samples were taken on September 4th and one of those was reported positive in November. When the dairy was visited for the second time, there were only two cows in the group, and yet it was impossible to find anything in either udder indicative of tuberculosis. Biological tests were done on the milk from those two cows and one sample

gave a positive result. At *post-mortem* examination of the cow which was giving tuberculous milk the only macroscopic lesion found was in the lungs. For five months tubercle bacilli were being passed, and yet there was no clinical evidence. That suggested that the biological test was a valuable adjunct to clinical examination. (Hear, hear.)

The other case suggested that there was an intermittent passing of tubercle bacilli in the milk. Here a sample was reported positive in June, in July group samples were taken, and in August one was reported positive. In this group there were four cows, and when the milk was subjected to individual biological test none was positive. Unfortunately the herd was dispersed, but it almost seemed that there was some intermittent secretion of tuberculosis organisms by some member of this group.

Hitherto he had not been very keen on the examination of the supramammary lymphatic gland, but, if he understood Mr. Dolan correctly, he was afraid that he should have to revise his ideas in regard to that. He believed Mr. Dolan to say that the percentage of his cases in the slaughterhouse showed the importance of the supramammary gland in connection with udder infection, and if that were the case, then he was certainly going to examine the supramammary gland in future.

Sir Weldon Dalrymple Champneys (Ministry of Health) said that he thought perhaps he was committing rather a presumption in getting up in that discussion, because they were discussing that morning a clinical matter which was within their scope but not very much within his. He desired to take that opportunity, however, of saying, first of all, how very interesting both the paper and the discussion upon it had been and, secondly, how gratified he had been to find that the conclusions to which he came with regard to the clinical examination of cattle, when he wrote the Memorandum on Bovine Tuberculosis for the Ministry of Health last year, had been confirmed by the discussion that morning.

It might be of interest to them if he read them one or two of the short conclusions which he put at the end of that Memorandum: he should be glad to get an idea as to whether they agreed with these. That Memorandum was a summary of the position at the time, and as to the possible methods of eradicating bovine tuberculosis.

He said therein: "Complete eradication by means of universal tuberculin testing and the slaughter of all reacting animals is not practicable in this country, not only on account of the expense and the dislocation of the milk supply which would be involved in any attempt at such a measure, but also because it is doubtful whether complete and permanent eradication could be effected by this means. A less drastic procedure, but one also involving the slaughter of infected animals, is represented by the Ministry of Agriculture and Fisheries' Tuberculosis Order of 1925. This Order aims at the destruction of cattle in an advanced and more infectious stage of the disease and cannot be expected, without the introduction of adjuvant measures, seriously to affect the incidence of the disease in cattle or man.

"The method of building up tuberculosis-free herds has been discussed, and the financial and other difficulties in the way of its success have been pointed out, but it is to be hoped that a more extensive trial will be given to it in this country."

He went on (continued Sir Weldon): "The next method of control considered is one which has only been tried to a small extent in England and Wales, but has given such encouraging results in Scotland that its area of operation is being rapidly extended."

There had been various references to the pioneer work done in Scotland, interposed the speaker, and he would like to add his confirmation of that: he thought some of their work had been perfectly splendid. (Hear, hear.)

"This method is the routine clinical examination of cattle, which, to be fully effective, should involve the thorough and systematic examination by competent veterinary surgeons of all the milk herds at stated intervals, say twice a year, and the exclusion of those found diseased. There is reason to believe that such a procedure, when employed in combination with other methods of prevention, is productive of beneficial results."

At this point the meeting applauded, and Sir Weldon raised laughter by commenting: "That seems to go down all right."

"The testing of milk by the microscopic and biological methods can be of great value, especially when applied to samples from herds of moderate size (a complete list of the contributing cows being made at the time of sampling) and combined with competent clinical examination of the cattle."

And this was the last one he was going to trouble them with: "All measures aimed at the reduction of bovine tuberculosis must lose a great part of their effect so long as milch cows are kept under conditions which favour the spread of tuberculous infection. The education of the cow-keeper in the prevention of bovine infection should therefore occupy a prominent place in any scheme for the eradication of bovine tuberculosis." (Applause.)

That, concluded Sir Weldon, appeared to meet with their approval, and it was very gratifying to know that.

Major J. G. McGregor (Stirling) said he wished to make a few remarks regarding a

movement which had been initiated recently by the West of Scotland Division and to which Mr. Wilson had referred in opening the discussion.

The clinical examination of the udders of cows was gradually taking the place in practice which had long been occupied by the examination for soundness of horses, and this change was significant of the altered conditions under which practice was now conducted in the north.

In the west and south of Scotland there were numerous auction marts, each of which had its own "Conditions of Sale," and at present there was a singular lack of uniformity in these Conditions. It was quite possible, and not infrequently happened, that a cow bought in one market as correct in the udder, would fail to comply with the condition of correctness in the udder in a neighbouring auction market.

The Division, after several discussions, had made a list of conditions affecting cows which gave rise to conflicting opinions and agreed among themselves as to the course they would follow when such cases arose in their practices. It was at present in communication with the Institute of Auctioneers on the subject and was hopeful that agreement would be reached and a uniform set of "Conditions of Sale" would result.

In the West of Scotland Division it was felt that there should be a clinical examination of all cows sold in auction marts.

These animals, in many cases, were being disposed of because their owners were suspicious of their soundness. Dairymen did not sell their best cows, they retained them as long as they were profitable, and it was felt that veterinary inspection of dairy cows in markets should be obligatory on local authorities.

On the subject of whether the veterinary inspector was the proper person to carry out the microscopical examination of milk samples, there appeared to be prevalent the opinion that because the veterinarian had made the clinical examination he was in a better position to do so than the bacteriologist, who had only the sample before him; but the rights of the cow, to say nothing of the rights of the owner of the cow, had to be kept in mind. Was it in keeping with our views of justice that the veterinary inspector should be at the same time both prosecutor and judge of the case? The evidence revealed by the microscope should be complete in itself before a cow was condemned on the result of a microscopical examination of a milk sample, and in the speaker's opinion the bacteriologist was the person who could give an unbiased opinion on the evidence submitted. The biological test was always available as the court of final appeal.

Mr. H. G. Lamont (Belfast) expressed some personal disappointment in Captain Simpson's paper, which merely emphasised the difficulties attendant upon clinical examination of the cow's udder: it was a triumph for the microscope.

He was surprised to hear the suggestion that the man who took the sample should undertake the microscopical examination; he thought busy practitioners would hardly approve. He was even more astonished to hear able and experienced practitioners discussing the importance of milking out the udder before undertaking clinical examination—he thought that was an elementary point they were all taught at college.

In regard to tuberculous mastitis, Captain Simpson had said that text-book descriptions were of little use in assisting them in diagnosis. He (Mr. Lamont) certainly thought it was a matter of clinical experience whether or not they could detect the condition, and that the essayist's remark concerning text-book descriptions might apply to the majority of observations they heard from that platform.

In the laboratory at which he worked they knew that when certain practitioners said "This is suspicious," it was almost certain to be a case of tuberculosis; but it was far otherwise with others.

Mr. S. V. Golledge (Trowbridge) observed that Captain Simpson had made a point of the naked-eye examination of the centrifugalised milk deposit. Could they get any readily reliable information from that as to the existence of tubercle bacilli? He was afraid that he had ultimately come to the conclusion that one was almost as likely to find tubercle bacilli in a heavy, thick deposit as in one of moderate amount, and yellowish and glutinous in character. Also, what was the significance of fibrin in the deposit?

He expressed great admiration for those people who found 90 per cent. of tubercle microscopically; if he found about 70 per cent. he thought he was doing fairly well. Mixed infection was more common than was generally supposed, and he thought that those who got the higher percentage to some extent selected their cases: that is to say, they did not submit every microscopically negative sample to the biological test but were inclined to exclude those which showed other organisms.

He would like to ask Captain Simpson if he thought that a cow could yield tuberculous milk and become cured? He had one case in which a bulk sample of milk from a herd of 11 cows was reported positive to the biological test. Being unable to detect the offending cow clinically, he took group samples, and one, containing the milk of three animals, was positive to guinea-pig inoculation. As these cows appeared healthy in every respect, he had their milks tested separately but the results proved negative. Thinking that perhaps an error had been made at the laboratory he sampled the whole

herd once more, the three suspected animals being dealt with singly and the remainder grouped, but although the constitution of the herd had remained unchanged no evidence of milk infection was discovered. At this stage he applied the double intradermal tuberculin test in the hope of being able to restrict the area of future investigation, but nine of the 11 animals reacted, including all the three in the positive group.

On three occasions since, at intervals of two months, he had sampled the three suspected cows, but all remained negative. All those cows had had a calf, but no "flare-up" of disease resulted, and they were still apparently all in perfect health although the inquiry commenced over 12 months ago. It might be suggested that accidental contamination was responsible for the infection in the bulk milk, but he took the first group samples personally under clean conditions and he also obtained a positive.

That experience rather supported the idea that a cow could, under certain circumstances, be cured of the disease, and it also lent some support to the theory that there might be an intermittent elimination of tubercle bacilli in milk from an infected udder.

Major T. G. Heatley (Woodbridge) said that, unlike most of the speakers that morning, he was not an inspector of animals and he would urge upon them the importance of not forgetting the farmer or the man who produced the milk. The producer with "doubtful" cows had his milk held up, and he wanted to warn the younger men who were carrying out those inspections against forgetting the farmer, because the latter was having a very thin time.

Veterinary-Colonel Graham Rees-Mogg, speaking as the owner of a dairy herd, referred to the very great difficulties with which he had been confronted in consequence of the prevalence of udder trouble.

A few years ago there was a great number of cases of summer mastitis all over the country owing, chiefly, to the number of flies and many deaths took place. It was important to note that if one had a large number of cows in one's herd suffering from contagious abortion, these two diseases went together: he had noticed this occurring in his own herd and had also been told the same thing by other owners and by other veterinary surgeons. He had done everything possible to try and prevent udder trouble: he had injected the dry cows and in-calf heifers with BIPP, as recommended by Mr. John Brown, of Invergordon; he had done that once a month and put collodion on as well, and there was no doubt that these were useful precautions, while applications of creosote and vaseline also helped.

The fact remained, however, that udder trouble continued to be a serious menace to successful milk production, and if a man had 20 cows he was very lucky if he had not one wrong in the udder. At the present time, out of 20 cows he had three that had lost a quarter.

Injuries, too, were a frequent source of trouble; it was common to have a big udder trodden by another cow.

He desired to say how much they had enjoyed the paper. (Hear, hear.)

Mr. F. L. Gooch requested the indulgence of the Chair to speak again for the purpose of expressing their pleasure at having with them that morning a representative of the Ministry of Health, which many of them had to serve. They welcomed Sir Weldon Dalrymple Champneys not only as a man, but because the Ministry of Health had accepted the invitation of the National Association to send a delegate, for the first time, to their Congress. (Applause.)

There was just one thing that Sir Weldon could do for them: if at any time there was an alteration in the Milk and Dairies Order, if Sir Weldon would use his influence to secure the insertion of the word "shall" instead of the word "may" it would help them very much. (Hear, hear.)

The Chairman (Major D. S. Rabagliati) now rose to say that he was sure that they would all agree that they had had a very interesting discussion, which had ranged over a large number of points. He had hoped that time would have allowed of his making a few remarks himself, but he must refrain, except to ask Captain Simpson one question, namely, as to what he meant by the following:—

On page 4, speaking of the tuberculin test, in paragraph 3, the essayist said: "Obviously a positive result is of no assistance towards allowing a diagnosis of tuberculous mastitis to be given. A negative tuberculin test does, however, at least eliminate the question of a tuberculous lesion in the udder, providing tuberculous disease is not widely distributed through the animal's body."

One other point was this: Mr. Begg said that he, in Lanarkshire, did not carry out any summer inspections. They all knew the great difficulty of those summer inspections, but he must say he thought they were just as necessary as winter ones. In the West Riding of Yorkshire they sent notices to the farmers, and carried out practically as many inspections in summer as in winter. A time-table was made out, according to the district, and the farmer was informed of the pending inspection: it was extraordinary how, with a little experience, one could keep to a time-table; also how willing the farmers were, once they got used to it, to bring the cows in. He admitted that, as a principle, notification was not desirable, but it only rarely happened that a farmer would try to hide a special cow.

The question of examining cows with full

udders was a difficult one. In practice, it amounted to this: was it better to leave them out entirely, or to examine a certain number there near milking time? It was a question of doing the best one could under very difficult circumstances.

He should like to express his gratification and thanks to Captain Simpson for his very carefully prepared paper. He thought the essayist had tackled the subject in a very wide and general way, without going too much into trivial details. (Applause.)

THE REPLY

Captain R. Simpson (Carlisle), in his reply to the discussion, said that the writing of a paper always involved a considerable amount of trouble, but he thought one's reward was to be found in the amount of discussion which arose from the paper, and he certainly felt rewarded on that occasion by the amount and character of the discussion which had taken place.

He was sure they were all indebted to Mr. Wilson for his very excellent opening of the discussion. He (Captain Simpson) purposely left out a good deal which would probably more particularly apply to the private practitioner, especially in regard to non-tuberculous forms of udder disease, so that the opener of the discussion might pick out those points and discuss them more fully; he thought that they would agree that this plan had worked well. (Hear, hear.)

As regards the question of the "feeling" of the udder on clinical examination, Mr. Wilson had said there was no necessity always for deep palpation. It was all a question of experience, but he (Captain Simpson) suggested that a superficial running over the udder *plus* a few questions to the owner, did not constitute a proper clinical examination.

Concerning the movement of the hind leg to facilitate palpation of the supramammary gland, he did not mean that one should have one or two attendants going round to assist in moving the hind legs of cows; it was merely a matter of spreading the hind legs a little in order to make the supramammary gland more accessible to one's fingers. In his view, palpation of this gland should never be omitted from one's clinical examination.

Mr. Wilson had suggested that microscopical examination of the milk might not be necessary in certain cases in regard to the diagnosis of tuberculosis of the udder. He (the speaker) would never give a diagnosis of tuberculosis of the udder without finding tubercle bacilli present in the udder, either by microscopic or biological methods.

As regards an acute form of tuberculous mastitis, there was no question that cases of that type did occur from time to time. His experience had been that when one got this type of case there was usually a mixed infection present.

Concerning information from the owners, he must say that the information thus acquired had never been of any great value to him.

Mr. Wilson had asked a question regarding a positive biological test being obtained without any evidence of a tuberculous lesion being found in the animal on *post-mortem* examination. He further suggested that in such case full compensation *plus* £1 should be paid to the owner. He (Captain Simpson) suggested that in such a case a pathological examination of the udder tissue ought to have been carried out before a definite decision was given as to the presence or absence of a tuberculous lesion.

As regards the legal aspect of the subject, this was one of the things to which he referred in his opening remarks. It was a most important aspect of the subject, and one which wanted following up, and he was quite sure that some sub-committee of the "National" might well go into the question and deal with it more fully, with a view to securing uniformity.

He was very much indebted to Mr. Begg for his kind remarks, and he desired to take the opportunity of acknowledging the experience which he had gained in Mr. Begg's department some years ago.

Perhaps Mr. Begg's description of the typical tuberculous lesion was strictly more accurate than his, but there was always a feeling of solidity present when a definite lesion existed, which was very characteristic to the trained fingers.

He thought that milk sampling carried out judiciously and at the proper place, was a very useful and necessary adjunct to clinical examination. They had to admit the pre-clinical stages of tuberculosis of the udder, and whilst this was so, there was no doubt that bulk sampling was necessary to further their work, but a great deal of the bulk sampling carried out at the present time was absolutely useless; it must be concentrated more and more in the rural and producing areas if it was to serve any useful purpose.

Microscopical examinations had been referred to by quite a number of speakers, and he had been taken to task for suggesting that it should be done by the clinician himself. He was still of that opinion; the practitioner had the clinical picture in his mind, and he was quite sure that those percentages which were referred to, of positive microscopical results, were obtained simply because the clinician had that picture in his mind; it encouraged him to go on and get results, whereas the laboratory worker was apt to pass over the microscopical examination more quickly than should be the case. The significance of the presence of cell groups had lately been

given considerable prominence, and the work done by Matthews and Torrance in this connection had considerably facilitated the ease and rapidity as well as the accuracy with which microscopical examinations of milk for tubercle bacilli could be carried out.

He had made reference to clinical actinomycosis in his opening remarks. He had seen very few cases of actinomycosis of the udder, but clinical actinomycosis of the udder was probably of more common occurrence than they were aware.

Mr. Dolan's contribution to the discussion was very interesting, and particularly his reference to the number of cases in which lesions had been found in the supramammary gland. He was inclined to review his ideas of the frequency with which the supramammary gland might be affected, in the light of the information put forward by Mr. Dolan.

As regards the use of the tuberculin test in the diagnosis of tuberculosis of the udder, he still adhered to his statement that a positive test was really of no assistance. A negative test certainly was, provided there was not present a widely distributed affection, when, as they knew, it was possible to get a negative result to the test. There might be cases in which the tuberculin test could usefully be employed, but its application in routine work seemed undesirable.

Mr. Burrow had raised a number of questions, all of considerable importance. First of all, he referred to the question of cowpox. He was afraid that the question of the use of the milk for human consumption from affected herds was one where the judgment must rest entirely on the merits of the case as revealed by the amount and severity of the infection present in the herd. As to the granules in sample bottles, he suggested that their presence was of no diagnostic value. He agreed entirely as to the difficulty of examining dairy cows in markets, where the cows were over-stocked.

Concerning grade A herds, he saw no reason for not allowing a cow to remain in the herd with a quarter which had atrophied and was functionless as the result of an attack of mastitis.

As regards prohibiting the use of milk from cows in a herd the milk from which had been found to contain tubercle infection through bulk sampling, he thought a great deal must depend on the result of the microscopical examination of the milk of individual cows actually suspected, and also on the nature of any lesions found on clinical examination. "Generally speaking, if a careful microscopical examination is carried out and is negative for tubercle bacilli, and there are no cell groups present and little or no deposit of a characteristic nature, it would appear to be unnecessary to hold up the milk of such a cow for six weeks pending a biological test being carried out."

The presence of fibrin, referred to by Mr. Burrow, was generally associated with a non-tuberculous mastitis.

So far as he (the speaker) knew, there was no clinical condition of the udder caused by the presence of *Brucella abortus* in the milk.

Mr. Gooch, and other speakers, also referred to the question of bulk sampling and the amount of individual sampling required during clinical examinations. As he had said previously, in his view bulk sampling should be concentrated in the producing areas to a large extent. He (the speaker) did suggest also that as they went on and gained clinical experience, the amount of individual sampling which was necessary could be reduced materially.

He was very grateful indeed for the remarks which had been made by the representative of the Ministry of Health. It had been encouraging to them to have him come down there, and particularly gratifying to the essayist that he had taken part in the discussion that morning.

In conclusion, he must apologise for having to curtail his reply. Many points raised in the discussion had had to remain unanswered, not because of any unwillingness on his part to reply, but solely on account of the fact that the time allotted for the discussion of the next paper had already been considerably encroached upon. He desired to express his thanks for the kindly reception which had been given to the paper.

The San Rocco Society, which has been established to further the interests of the bigger breeds of dogs, such as bloodhounds, borzois, deerhounds, Great Danes, Irish wolfhounds, mastiffs, Newfoundlands, and St. Bernards, is called after St. Roch or Rocco, who was born in France about 1295, and whose life was said to have been saved by a dog. It is intended to provide an annual open show, alternately in London and the provinces.

* * * * *

Aberdeen Corporation has a stud of 61 Clydesdale horses, valued at about £4,500. At the annual inspection, Mr. A. R. Findlay, the superintendent, said that the principle followed in purchasing was to buy the best. The average price paid this year was £61, and the average height of the horses was from 17 to 17·2 hands. Bought in at five years old, the average period of service of the animals is from ten to thirteen years.

* * * * *

Silver fox farming is a line of enterprise that continues to claim more and more attention, and the number of "estancias" devoted to this business in Scotland mounts steadily upwards toward the dozen, although it would only be about twelve years since the trail was blazed at the Snow Belt farm in Ross-shire. One of the latest and most considerable additions to Scottish farms rearing this 12-14 lb. species of Canadian fur-yielding fox is that started about a year ago at the estate of Glenny.

ANIMAL PSYCHOLOGY

MAJOR-GENERAL SIR JOHN MOORE,
K.C.M.G., C.B., F.R.C.V.S.

Speaking to the Psychological Section of the British Association at York a fortnight ago, Mr. Rex Knight, of Aberdeen, questioned the belief in character and intelligence of animals. He stated that there was no clear evidence that they ever recollected things or that they had memory in any mental sense. Mental activity of animals, he affirmed, was nothing more than a matter of conditioned reflexes, of altering and adjusting the animals' inborn ways of behaving. His remarks gave one the impression that animals have no minds, and that any arguments which would reconcile animal behaviour with consciousness or mind should be rejected.

Consciousness is manifested in cognitive, affective, and cognative attitudes. Perception, memory, reason, instinct, imagination, thought, capacity to learn, pleasure, indifference, displeasure, feeling, love, sorrow, doubt, intense desire, and other attributes of mind are referable to these three above-mentioned manifestations. It is also important to remember that reflex acts are chiefly referable to the spinal cord, whereas the domain of mental activity, whether of human beings or of animals, is the brain with its complexity of centres and its millions upon millions of neurons initiating special functional sense and action.

It is a common feature of books on Psychology to base opinion of animal behaviour and mental experience on anecdote, and to deduce an imperfect picture of analogy of mind from some pretty story. As a matter of fact, anecdotal evidence and deduction is more prominent in human than in animal psychology, and full inspiration is provided thereby for the novelist and dramatist. The so-called conditioned reflexes are even more applicable to human beings than animals.

To my mind, such statements are quite wrong, and cannot be supported by those who have had the practical experience of owning and being intimately associated with various breeds and classes of animals, both in health and in sickness. Anecdotal evidence would certainly not be subscribed to by the veterinary surgeon, who, by his special training and experience with animals, is brought into daily contact with the many phases of animal psychology, and is in a position therefore to understand animal mind and to form correct conclusions.

However, it is refreshing to note in the letter from Mr. Knight published in the *Veterinary Record* last week, and in the accompanying summary of his address, that he did not deny that animals had minds. In other words, this may be taken to mean that he now acknowledges that they are endowed with minds that actively function. I trust that his outlook on the subject will be further broadened by enquiry and more practical experience, to enable him to admit that animal behaviour can be explained, or at all events in the main, by the attitude of animal mind analogous to, though perhaps less discreet than, the human mind.

Much play has been made on language in the sense of verbal expression, and parade is constantly being made of Descartes' view that animals do not speak, not because they lack the organs concerned in speaking, but because "they have nothing to say." This is a very poor argument to adduce. Animals do have speech, though it may not be classed as language or verbal expression in the true acceptance of the term. Their vocalism is one of degree, known and appreciated no doubt by their own particular species, and perhaps not within the ambit of other species or the human being to interpret or define with exactitude as to meaning. Nevertheless, they are in a great measure endowed with vocal expression which is sufficient unto themselves to portray their likes and dislikes, their pleasures and their pains, their material wants and their intense desires, their devotion to their kind, and all those natural faculties of mind as may be dictated by instinct, reason, will, special sense, etc. Were animals endowed with any more vocal expression or language than they are at present they would prove themselves somewhat disconcerting to each other, and an additional trial to human beings. It would be rather a novel procedure if the horse could discuss the quality and weight of his oats with the grain merchant or farmer, the cow elaborating a scheme for increased milk supply (free from the tubercle bacillus) with the dairyman, the dog discussing with the veterinary surgeon as to the merits of vermifuges in general, or the cat arguing with the milkman over the poor cream line of his milk. The power of speech and language has its inconveniences as well as its advantages, and it might make for the better order of things in life if there was a curtailment of "talk" on the human side in some directions.

However, the purpose of this article is not to discuss abstract principles of Psychology, but to give instances of the deliberation of animal minds founded on fact and personal experience.

A favourite Australian steeplechaser horse of mine, winner of the Indian Grand Military Steeplechase at Lucknow in 1895, and whom I brought to England subsequently, fell with me one day while hunting with the York and Ainsty Hounds. I was hung up by the stirrup, between his legs, and the bridle reins were outside my grasp. Hounds were running strong at the time, and the natural instinct of a horse in such a case is to follow on. Not so, however,

with my dear old friend and companion—a companion and a well brought-up gentleman in every sense of the word. He stopped dead 20 or 30 lengths from the fence, felt me underneath him, and then put his off hind-leg carefully down by my side until an officer of the Cavalry regiment to which I was attached came up and liberated me. The point at issue was what process of reasoning operated in his mind in realising the somewhat serious situation and in deciding him to stop until assistance arrived. The fall was occasioned by the country at the time of the year (opening day, November 1st) being difficult for an Australian horse who did not understand "blind" ditches on the take-off side of fences. He was all of a tremor and came to grief in consequence, but his careful regard for me rose above his own fear. Another trait in this horse's character was his love and appreciation of music. He would stand for hours with his head over the half-door of his loose-box in barracks listening to the regimental band practising. Alas, the end of this gallant animal was a very sad one. Turned out to grass while I was in South Africa during the Boer War, he took a violent fancy to several foals at foot with their mothers. He thought it was his duty to shepherd them, and he used to drive the mothers away from them. Proving himself such a nuisance, he was put into a pasture a mile distant, but being a steeplechaser, he set himself at six intervening fences and was soon back amongst the mares and foals. He was then taken to a farm five miles off, a place he had visited many times before. He was placed in a field by himself, but he was determined not to stay there. He knew the road home, and in his anxiety to return he chose a ragged piece of fence in jumping on to the road, staked his hock joint badly and eventually had to be destroyed, much to my grief. So ended the most lovable horse a man ever owned. And yet there are people who would deny reason, discrimination, memory, and other attributes of mind to animals.

A really remarkable instance of perception, reasoning power, and the "felt-tendency" of psychological literature and parlance occurred in a case of life-saving of rabbits by a sheep dog, the property of a nephew who is a sheep farmer in the County of Northumberland. The River Aln, which skirts his land, was swollen in flood, and a number of rabbits were washed out of their burrows in the river bank into the water and were in danger of being carried away. The sheep dog, seeing their plight, and without any direction from his master, but purely of his own volition, immediately jumped into the water, and successively brought nine of them safely ashore, mouthing them very gently, and placing them on the river bank to run away to safety. What a fine example of animal behaviour, inspired not by any puerile ideas of so-called conditioned reflexes, but governed by a genuine exercise of will power which speaks volumes for animal kind, and eclipses many aspects of human character and intelligence.

Years ago, when I was a small boy, a pair of house-martins built their nest in the corner of a window of my mother's bedroom. The members of the swallow tribe are very discerning little people, and in their building operations their concept is permanency of habitation. The pair used to come back year by year: my mother had the faculty of remembering them and they recognised her as a friend. One year during a storm the nest fell down, much to the distress of the birds. It was duly fixed up again for them, the birds rendering their assistance in completion of the process, chattering their appreciation in their own peculiar way. At last there came a time when the old pair failed to return, but my mother always affirmed that the new tenant of the nest was an offspring of the old birds. The sense of perception and direction in migrating birds and the powerful memories which will lead them to the snug window corner of the same house where they had reared their first broods is a remarkable phase of mental activity which comparative psychology has not yet been able to reconcile or adequately explain.

A good deal of the inner working of the animal mind can be learned from the community of cats. I have an ordinary black cat who has been accustomed for years to be groomed before going to his bed at night. If by any chance the process is omitted, he will sit at my bedside and by voice and gesture reprove me for my delinquency. The affective and conative attitudes of consciousness are developed in him to an extraordinary degree. He certainly has ideas of his own, profits by them, and is quite equal to making plans with a definite picture or purpose in his head. Such, at all events, is the evidence I have from him personally after an association of many years.

I conclude by saying that animal psychology is a subject that is worthy of closer study, not by experimentation, but by observation of those who are experienced with animals, and the piecing together of reliable data which only close observation and inference can define. The bogy that animals are but reflex machines must be laid low for ever, and a sensible view taken of them as creatures of intellectual capacity, and capable of exercising understanding.

An investigation is being held with regard to the cause of death of about 300 sheep in the Swansea Valley. Farmers in the district allege that the compulsory second dipping in full-strength dip has been responsible for arsenical poisoning of the sheep.

Clinical Communications

DIVERTICULA OF THE SMALL INTESTINE*

J. R. RIDER, M.R.C.V.S.
Darlington

INTRODUCTORY.

A chronic incurable debility occurring amongst pit ponies, characterised by a varying degree of hypertrophy of the wall of the small intestine, and sometimes associated with macroscopic diverticula, has been described in an earlier paper[7].

There exists a copious literature on the subject of intestinal diverticula in human medicine, but British veterinary literature contains few references to the subject. Gray[4] has pointed out that an account of the condition is given by Cadéac in French veterinary literature, a source of information which was not available to me in 1930. A further important contribution, containing 119 references, has been made by Petersen[6] in Denmark.

The observations on pit ponies, while conforming generally to the findings recorded in medical literature, present certain points of difference, two prominent features in this connection being:—

1. The constancy with which changes have been observed in the small intestine of the horse, while in man the large intestine is much more commonly the site of lesions.
2. The frequently observed muscular wasting which accompanies the condition in the horse, contrasted with medical experience which shows that diverticula may be found either in well-nourished or in thin individuals.

The incidence of the disease in pit ponies is quite low, and not great enough to assume serious economic importance, but the loss of efficiency due to the progressive wasting is troublesome in a well-managed stud. It is possible that observations in the horse may be of value in the elucidation of the problem in man, particularly having regard to the findings of Spriggs[8], who states that diverticula may occur in 10 per cent. of human beings examined.

Multiple intestinal diverticula have been recorded in the sheep by Gill[3], in New Zealand, and in the ape by Fox[2], in America.

ANIMALS AFFECTED.

In the present series, in which is included an example of Meckel's diverticulum, five of the cases have occurred in imported Iceland ponies, and one has been seen in a Shetland pony. The average age at death has been 8½ years.

The condition is one which becomes manifest during adult life, a point in agreement with medical observations, but as it appears to be of slow and insidious development it is probable that it originates at an earlier age. The youngest pony in which organic change in the small intestine was found at *post-mortem* examination was four years old, and the oldest was aged fourteen years. Neither of these animals is included in the present series.

SYMPTOMS.

Attention is usually directed to the animal because of its unthriftiness, some weeks or months after being sent to work in the pit. One receives a report that the pony is a capricious feeder, appears to be lifeless, is not developing muscle in the customary manner, and though a willing worker is physically unable to take its fair share of the work. Sometimes the report is to the effect that the pony, previously in good condition, has begun to lose muscle, and the wasting is progressive in spite of rest and nursing.

Clinical examination shows a general wasting of muscles. The crest has disappeared, it may be possible to palpate the ligamentum nuchæ, and there is an obvious condition of ewe neck. The muscles of the back loins and quarters are wasted, and the ribs and tuberosity of the ilium are prominent. There may be an appearance of pendulous abdomen. The coat is harsh and staring and the skin hidebound. The appetite is capricious, food is eaten without relish, mastication is slow and lacking in vigour, increased borborygmi may be observed, and there may be some degree of constipation. There may be slight tenesmus, and fæces when passed occur in large firm masses, lacking the usual arrangement of facetted pellets. Rarely, a history of periodical abdominal pain can be obtained. In such a case the symptoms have been those of sub-acute obstruction, and have been relieved by simple measures.

DIAGNOSIS.

Diagnosis based solely on physical examination, and a consideration of the history, though it may be suggestive is not necessarily conclusive. The symptoms occurring in a pony recently sent to work may point towards some organic lesion of the small intestine, particularly if there is available another animal which, having begun work at the same time, and under similar conditions, is developing satisfactorily. Rectal examination may be extremely useful. In the average pit pony it is possible to locate the duodenum as it crosses from right to left below and behind the kidneys. It may then be possible to detect the thickened wall and to confirm the suspicion aroused by the symptoms. A negative rectal examination is of no value, for the lesion may be found posterior to the duodenum, and the

* Presented to the North of England Division, N.V.M.A., Newcastle-on-Tyne, July 2nd, 1932.

certain recognition of coils of small intestine becomes less easy.

As the terminal ileum is normally thicker than the remainder of the small intestine it is necessary to remember this fact in making a diagnosis.

Other possible causes of mal-nutrition, such as overwork, dental disorder, or the presence of sclerostomes must not be overlooked. Sclerostomes are occasionally responsible for unthriftiness in ponies sent to work from pasture, but they are of less importance in an animal which has been in the pit for a long period. An examination of the fæces for the parasites or their ova will assist one in determining their significance. If parasites be suspected as the cause of the debility the appropriate treatment does not yield beneficial results if a thickened bowel wall is also present.

In man the use of X-rays yields positive information, though its correct practice and interpretation calls for a refined technique. By this method Spriggs and Marxer[9] have been able to show not only the stage of established diverticula, but also what they term a prediverticular state, in which characteristic changes occur in the haustration of the large intestine. By means of superimposed serial films they have demonstrated rigidity in areas of the colon, before the formation of diverticula could be detected, and as a result have been able to direct treatment towards the retarding of the development of the pouches. Such refinements appear to be impossible of attainment in veterinary practice; they are certainly impracticable in the case of mine animals.

TREATMENT.

Treatment, being governed by the economic factor, is entirely unsatisfactory in mine animals. The only measure which has proved beneficial is a period of grazing, preferably during the summer months. If circumstances permit an animal to be worked underground, and brought to the surface for grazing daily, it may be possible to prolong the useful life of the pony. Such conditions are rarely attainable, and a diagnosis confirmed by positive rectal examination justifies the destruction of the animal, on economic grounds alone.

POST-MORTEM FINDINGS.

Perforation of the small intestine, of the pistol shot variety, and frequently occurring at the junction of the second and third parts of the duodenum, is sufficient to suggest organic change in the wall of the small intestine. Closer examination shows the intestine to be more firm and rigid than normal. There may be present small swellings along the mesenteric border, lying between the layers of mesentery, or there may be seen vesicle-like structures below the serous coat in other positions. Thirdly, there may be no macroscopic evidence on the serous coat of the presence of diverticula. When the gut is sectioned longitudinally along the free border the mucous membrane is seen to be thrown into folds, often showing areas of congestion, and superficially resembling Johne's disease in cattle. In some cases the mouths of the diverticula may be quite obvious, in others it is necessary to palpate the intestinal wall, when gaps in the muscular coats may be detected. Attention should be paid to the mesenteric border, where small diverticula often occur in pairs. Dissection may show a firm constricted ring in the muscular coats, through which the mucous membrane has protruded. The pouch thus formed tends to assume a balloon-like shape.

HISTOLOGY.

A characteristic feature of the condition is the increased thickness of all coats of the bowel wall. There appears to be an hypertrophy of the circular and longitudinal muscles with quite definite large spaces between the muscle bundles. Some of these spaces are occupied by dilated vessels. In a non-diverticulous area the mucous membrane does not appear to show serious change, nor does there appear to be a large increase of connective tissue.

In a section through a diverticulum the muscular coats are attenuated over the apex of the pouch, there may be an infiltration of round cells and an increase of connective tissue. In one case elements of mucous membrane were found, bounded by connective tissue fibres, near the peripheral border of the circular muscle.

Sections of normal small intestine of the horse show that the muscular bundles are more loosely connected than, for example, in the dog. The changes seen in hypertrophy of the intestinal wall suggest that the normal characteristics are greatly accentuated to produce the typical picture, in which the increased size of muscle bundles, and the spaces between the bundles, are constant features.

ETIOLOGY.

It is generally agreed that certain diverticula occurring at the termination of the ileum are due to the persistence of the fœtal omphalomesenteric duct (vitelline duct of the yolk sac), and are comparable to Meckel's diverticulum in man.

The causes of diverticula occurring in other situations are not yet finally decided. Cadéac[1] suggests mechanical obstruction with a weakening or paralysis of the intestine. He includes circulatory troubles, aneurism thrombus or embolus, as well as pressure on or degeneration of intestinal nerves as causes of weakening the intestinal wall, which lead to paralysis of the organ. Spriggs and Marxer[9] by means of careful radiography have shown rigidity in areas of the intestinal wall before the actual demonstration of diverticula, and they favour the view that an infective process is at work.

A third view propounded by Mortimer-Woolf[5] is that hypertrophy of the muscle and the formation of spaces is the important factor, this being due to inco-ordination of the neuro-muscular mechanism of the intestine. Thus the segments may be contracting independently and not as a correlated whole, and eventually pieces of mucous membrane become drawn or forced into the wide spaces between the muscle bundles. He therefore believes that the dilated blood vessels which are found associated with the condition are the result, and not the cause of the hypertrophied muscle.

Whatever the causes of the condition may ultimately prove to be, it is clear that we have a condition of more than passing interest to both the medical and veterinary professions—a condition which causes much discomfort and suffering to human beings, and no little inconvenience in the management of animals in which its existence is suspected. It is one in which the fullest co-operation between members of the two branches of the science of medicine is necessary for the final solution of the problem.

Case Records

No. 1,382. Iceland gelding, eight years.
Previous history suggested hypertrophy of the intestine. August 20th, 1930, sub-acute abdominal pain. Rectal examination showed thickened duodenum. Death nine hours after onset of symptoms. *Post-mortem*:—Perforation of duodenum at junction of second and third parts. Whole of small intestine thickened. Many small diverticula along mesenteric border, not visible on serous surface.

No. 532. Iceland gelding, ten years.
Previous history suggested hypertrophy of intestine. Died from ruptured diaphragm. *Post-mortem*:—First half of small intestine thickened. Small diverticula along mesenteric border, not visible on serous surface.

No. 490. Shetland gelding, eleven years.
Had worked underground for three years prior to 1926. Was used on the surface for light work until 1929, and then returned to underground work, in excellent condition. Gradually became debilitated, without history of abdominal pain, and was destroyed as incurable in October, 1930. *Post-mortem*:—Whole of the small intestine grossly thickened. Two diverticula found at duodeno-jejunal junction, not visible on serous surface.

No. 383. Iceland gelding, twelve years.
Acute abdominal pain terminating fatally after seven hours, no previous history. *Post-mortem*:—Perforation of diverticulum in the terminal ileum (Meckel's diverticulum). Remainder of small intestine normal.

No. 1,272. Iceland gelding, seven years.
Previous history of unthriftiness with slight constipation. Borborygmi pronounced, fæces unformed. Rectal examination disclosed coils of thickened small intestine lying within the pelvic cavity. The pony had been kept under observation for three months on the surface and was in good condition when destroyed. *Post-mortem*:—Whole length of small intestine grossly thickened. Many diverticula of jejunum, small but palpable. The majority occurred along the mesenteric border, often in pairs. Others occurred in other areas of bowel wall.

No. 1,571. Iceland gelding, seven years.
Involved in an accident underground in October, 1930, at which time the appearance was suggestive of hypertrophy of the bowel wall. Muscular development gradually improved and there was no further history until February, 1932, by which time the pony appeared normal in every way. On February 9th acute diarrhœa occurred, followed by death four and a half hours later. *Post-mortem*:—Perforation of duodenum at junction of second and third parts, muscular coats ruptured longitudinally. Duodenum and jejunum thickened, though to lesser degree than in other cases. Small diverticula palpable along mesenteric border.

References.

[1]Cadéac, C. 1896. Pathologie Interne des Animaux Domestiques. Vol. 2, 264.
[2]Fox, H. 1923. Disease in Captive Wild Mammals and Birds. Philadelphia. pp. 219-220.
[3]Gill, Dudley A. 1929. *Veterinary Record.* IX, 638.
[4]Gray, H. 1930. Private Communication.
[5]Mortimer-Woolf, A. E. Private Communications.
[6]Petersen, W. W. 1930. Die Divertikel Am Digestionstraktus.
[7]Rider, J. R. 1930. *Veterinary Record.* X, 707.
[8]Spriggs, E. I. 1927. *Lancet.* May 21st. 1067.
[9]Spriggs and Marxer. 1925. *Quart. Jnl. Med.* XIX. No. 73.

Discussion

Mr. Mortimer-Woolf thanked the Chairman (Mr. H. Hicks) for his welcome, and said he was very glad to visit their Association for two reasons, firstly, to express his gratitude publicly to Mr. Rider for all the assistance he had given him in providing material, and, secondly, because he thought that there were many subjects of interest to both branches of the profession which required elucidation. He could imagine no better subject from this point of view than the one under discussion.

Many slides had been thrown on the screen, some showing the pathological aspects of the disease in the human, the majority in pit ponies—material kindly lent by Mr. Rider. The constant features in all these slides, *viz.*, first the great hypertrophy of the muscular coat of the intestine, second the gaps in the muscular coat, and third the presence of large dilated vessels in these gaps where the diverticula appeared, were emphasised. Specimens were also shown where animals had died with the typical symptoms of the disease without apparent diverticula. These were only discovered on microscopical examination.

Mr. Mortimer-Woolf discussed briefly some of the differences in the disease as it appeared in man and in horses. In the former, the large intestine was most frequently affected, the patients were commonly fat, and in some cases obese, and the diverticula appeared on the anti-mesenteric side of the gut. In horses, the small intestine was almost invariably the portion of the alimentary canal involved, the diverticula nearly always appeared at the mesenteric border and sometimes penetrated in between the leaves

of the mesentery, and the animals appeared to be debilitated and wasted. The current views as to causation were briefly discussed.

Mr. Mortimer-Woolf did not believe that diverticulitis was primarily an inflammatory disease, as was believed by the workers at Ruthin Castle. He showed a slide of a sunbear which had died of tuberculosis, and in the large intestine were apparent diverticula. Microscopal section, however, snowed them to be of a totally different character from true examples of the disease. The diverticulum in this case was a true ulceration and perforation of the wall of the intestine which was protected by an inflammatory granulomatous covering, in which tubercles could be demonstrated.

The speaker believed that the view first propounded by Sir Arthur Keith was in all probability the correct one, *viz.*, that in the first place there was a dysfunction of the neuro-muscular mechanism, so that the musculature, instead of working as a composite whole, worked independently and in waves. This would result in small pieces of mucous membrane becoming sequestered and the subsequent development of diverticula.

Mr. J. Whillis thanked Messrs Rider and Mortimer-Woolf. Quoting as the source of his information an essay, as yet unpublished, by Mr. G. A. Mason on "Intestinal Diverticula in Man," the speaker called attention to the following points which appeared to him important in the ætiology of diverticulosis:—

(1) That obstruction alone could not cause the condition because:—X-ray examination in man showed that the diverticula were empty during contraction and full during relaxation.

Where diverticula are associated with obstruction they are present above and below the obstructed segment.

Most obstructive lesions are not associated with diverticula.

(2) That infective changes are just as likely to be secondary as to be the cause of the condition. Gross secondary infection would also account satisfactorily for such changes as are present in the cells of the visceral nerve plexuses, and for such vascular changes as embolism and thrombosis.

(3) That Mr. Mortimer-Woolf's hypothesis failed to satisfy him completely for the following reasons:—In his opinion, no proof had been advanced that there was a neuro-muscular dysfunction in the intestine. He would be glad to know if Mr. Mortimer-Woolf had any radiological evidence of such dysfunction in man or animals. The gaps in the muscle described were not satisfactory evidence of the fact that the gut was contracting in segments rather than as a whole, because they did not extend completely round the circumference of the bowel.

(4) That no stress had been laid on the possibility of diverticula having a developmental origin. For this hypothesis the following favourable evidence could be brought forward:—

During development the epithelium grows more quickly than the mesodermal sheath which forms the muscle and serous coat. The formation of epithelial buds at this stage, when the vessels are being formed, would explain the interrelation of the diverticula, the gaps in the muscle, and the vessels.

Intestinal buds occur constantly in pig embryos.

Duodenal caeca are present in the adult salmon.

Diverticula so formed, although small, would be increased in size by pressure within them and by the traction of fibrous tissue laid down as a result of secondary infective changes.

Mr. G. A. Mason expressed his thanks for the invitation to attend and to speak on intestinal diverticula. However, as he only learnt of the meeting at 1 a.m. that day, after driving for over 300 miles, he was afraid that he had been unable to prepare in any way for that discussion. Fortunately, during his absence, Dr. James Whillis—having had access to his (the speaker's) material—had given them his views on that subject. With these he was largely in agreement and Dr. Whillis had done what he should have attempted. Neuro-muscular derangement was favoured by Mr. Mortimer-Woolf as a probable cause of the condition which they, in the human, associated with the large intestine. He feared he was unable to follow his arguments, but no doubt he would be doing further work on the question and perhaps it would then be clearer. The question, however, was not merely one of weak muscles and stasis, as the condition is unknown in the thin-walled and atrophied colons associated with colonic stasis. Nor, moreover, was increased intracolonic tension due to even an organic obstruction a satisfactory explanation. Specimens were on show that afternoon where diverticula were present both above and below an associated growth. The fact that diverticulosis was rarely recognised clinically until late in life was perhaps a strong argument in favour of the diverticula being acquired anomalies. They did, however, occur in young subjects. In his series the condition was present in the appendix of a young woman aged 17 years. No completely satisfactory reason for their appearance had been offered. The more diverticulosis was considered, the more it was felt that the condition might be congenital; however, it was an impossible question to prove at present. There were, however, one or two points to bear in mind. Case[1] and other X-ray workers had commented upon the frequency with which diverticula of the colon and of the duodenum are associated. Now and again a case such as Lane's[2] cropped up where diverticula of many organs—bladder, colon, duodenum and œsophagus—were present. Mr. R. J. Willan, Honorary Surgeon at the Royal Victoria Infirmary, Newcastle, recently supplied him with notes of two sisters upon whom he had operated for perforated diverticula of the sigmoid—an interesting coincidence. It was important to realise that if the congenital nature of those pouches was admitted, increase in size might be favoured by stasis or obstruction. Personally, the more one studied diverticula the more one was driven to the conclusion that pulsion rarely, if ever, played a part in their production, except in the case of the urinary bladder.

Mr. W. Jackson Young said that although he had made a large number of *post-mortem* examinations of domesticated animals, he had never encountered diverticula.

There seemed to be more than one school of thought with regard to the formation of diverticula, and he was inclined to think that the expression "ety. dub.," used in dictionaries in connection with the derivation of words, could be modified to "eti. dub." (etiology dubious) when the origin of diverticula was considered. If the condition had solely been found in the duodenum he would have been inclined to suspect some degenerative process of Brunner's

[1]Case, J. T. *Journ. Amer. Med. Assoc.* 1920. LXXV. 1463-70.

[2]Lane, W. Arbuthnot. Guy's Hosp. Reps. XLIII. 1885. 48.

glands, which were only found in that part of the alimentary tract. He could imagine degenerative changes in the glands of Brunner and Leiberkühn that might enable the mucous membrane to be protruded into the muscular coats.

He was disappointed that in the description of the sections exhibited there had been no mention of the intestinal glands.

The congenital theory of formation he could not follow at all, but there might be something in the neuro-muscular dysfunction theory put forward by Mr. Mortimer-Woolf.

He could imagine, although having no clinical knowledge of the condition, that secondary processes would take place in the diverticula and such processes might either be mechanical or inflammatory. It would be possible for the diverticula to be filled with fæces or a foreign body and perforation would follow.

The diverticula would also be liable to the various forms of inflammation and gangrene.

It was rather alarming to know that 10 per cent. of human beings over the age of 45 were affected with diverticula.

He was sure that in carrying out research into this condition in animals some good might follow for the human species.

The presence of medical confrères at the meeting was appreciated and he would like further information as to whether changes in the glandular system of the intestine or in Meissner's plexus had been observed.

Mr. H. S. Elphick asked whether diet might not be a contributory factor, and whether fish and chips in the human being might not be included in that theory. Many of the cases Mr. Rider quoted about ponies were in reference to Icelandic ponies. Such ponies, he said, ate fish and fish bones.

Mr. P. Snaith said he remembered two cases that might have been diverticula, and both were associated with the small intestine. There were tumors about the size of a shilling and a two-shilling piece, quite black, on the mucous membrane. Unfortunately, no microscopical examination was made.

Mr. J. H. Taylor asked if Mr. Mortimer Woolf could give any symptoms of the diveritcula in man. It appeared that the trouble arose suddenly. He knew of a case where a man was struck suddenly by the disease and within 24 hours he was being operated upon in a nursing home. The man made an excellent recovery, after a long piece of the bowel was taken away. The patient was seen that very morning, and he was looking the picture of health.

The Chairman asked Mr. Woolf if he had noticed any occupational connection with the disease, whether it was more prevalent in certain trades or occupations than in others. Mr. Rider might tell them whether he noticed before the onset of symptoms whether the animals were inclined to adiposity or whether they were in normal condition.

Replying to the discussion, Mr. Mortimer-Woolf said that, with regard to X-ray examination of cases, caution had to be observed. If complete filling did not occur the appearance of diverticula was easily produced. With regard to the congenital theory, it was difficult to know what was meant exactly. When one went to rock bottom, everything was congenital. Where glandular elements in diverticula were found, one was led to believe that they were developmental and probably of a different character from the cases under review. Why the small intestines in animals should be affected and the larger intestines in man be attacked, he would like to know. It was very rare to find the trouble in very young people: it was a disease that occurred in man apparently after middle life. He could not believe that the disease was congenital. When perforation took place, it was frequently fatal. Continuing, Mr. Mortimer-Woolf stated that he had no knowledge of the effect of diet or about fish. If he had to describe the symptoms of the disease in man, it would take a considerable time; in a large number of cases there were no symptoms at all, and he expected a lot of people were walking about with diverticula quite unknown to themselves. When the symptoms did show they would be two-fold in character: (1) obstructive and (2) inflammatory. He really did not know that there was any occupational incidence about the disease. Were Northern ponies (Icelandic and Shetland) only affected?

Mr. Rider: "It has been seen in Welsh ponies."

Mr. Mortimer-Woolf: "One was wondering whether there was something inherent in such Northern ponies."

Mr. Rider said that, with regard to the condition of animals before the onset of symptoms, there was nothing to detect in them to lead one to suppose they had the illness. In answer to Mr. Snaith, Mr. Rider said he had seen the black areas or tumors under the serous coat of the small intestines in animals.

A DIFFICULT CALVING CASE*

N. H. BROOKSBANK

Royal Veterinary College, London

The cow was moved into a large suitable loose-box. The vulva and buttocks were thoroughly washed with soap and water containing an antiseptic. The hands and arms of the operator were washed with soap and water, and the arms then smeared with antiseptic lubricant.

The position of the fœtus was examined. It was found to be a posterior or breech presentation, with the tail hanging out and the two hind limbs extended forward.

The buttocks of the fœtus had dropped below the brim of the pelvis, and it was impossible to secure either of the hind limbs.

The cow was now cast, and a cotton rope tied above her hocks, which were drawn upward to an overhead beam until the vulva was about three feet from the ground. On re-examining the position of the fœtus it was found that one could reach only as far as the tibia. The fœtus was repelled by hand, and later by means of a crutch, but this did not enable any more of the hind limbs to be felt.

It was impossible to withdraw the fœtus directly as it was greatly distended and emphysematous. It was, therefore, decided to remove one of the hind limbs by means of a wire saw, and the procedure was as follows.

* Case in series presented for award under the N.V.M.A. Clinical Prize Scheme for Students, 1932. Four figs. in original.

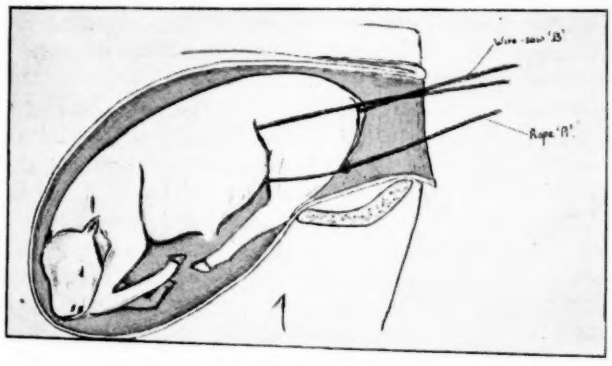


Fig. 1.

A cord with a fixed loop at one end was passed round a limb close to the top of the femur, and brought outside. The free end of the rope was passed through the loop, so forming a large loop round the leg. This loop was pushed down as far as possible over the stifle joint and drawn up firmly round the tibia. (Fig. 1, rope A.)

The wire saw was slipped between the limb and the body of the fœtus, but it recoiled when released by the hand. A spring band, as illustrated in Figure 2, was then employed to pass the wire round the limb. The free end of the band was pushed round the leg, and, as the band was curved, it was easily reached with the free hand of the operator. To the cord attached to the band was tied the wire saw, which was pulled round the limb as the free end of the band was drawn out of the vulva.

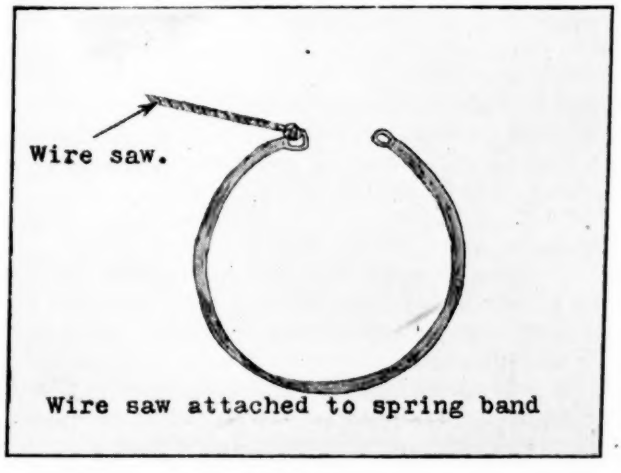


Fig. 2.

The two ends of the wire saw were now outside the vulva, and were drawn up the limb as far as possible. The wire saw was next crossed in order not to damage the mucous membrane, and worked in a criss-cross fashion. (See Fig. 1, wire saw B.)

In about one minute the limb was severed near the top of the femur, whereupon the fœtus was repelled and an assistant pulled the limb out.

The hock of the other hind leg was now easily reached. A rope was placed round the tibia as with the previous limb and pulled upon, while at the same time the fœtus was repelled. This enabled the hock to be flexed and the fetlock joint to be reached. The rope was slipped down to below the fetlock joint, and an assistant pulled on it. While this was being done, the leg was guided until it had turned round and lay outside the vulva.

The cow was lowered to the ground, and the vulva and as much as possible of the fœtus were lubricated, which permitted the fœtus to be withdrawn without any difficulty. Examination of the uterus then revealed that we were dealing with a twin pregnancy, and that the second calf was also a breech presentation. There was, however, no difficulty in reaching the fetlocks and turning the hind limbs backward, and by means of two ropes, one round each fetlock joint, the fœtus was easily drawn out. It was found to be dead, and small, but much larger than a sheep-dog.

The vagina and uterus were examined, and no wound of any kind could be discovered. The cow was on her feet in about ten minutes, and was given a stimulant. She cleansed that evening, and thenceforward made satisfactory progress.

The use of the wire saw in this case was a revelation to me, and I cannot imagine that anything more effectual could be devised. Certainly it does away with any necessity for those expensive, heavy and cumbersome instruments called embryotomes. A limb, neck, or a part of the spine can be severed in less than five minutes without any risk of damage to the genital organs of the mother, and the saw goes through bone as a knife through cheese. It is important to cross the wire as it emerges from the vulva, so that the cut is inward and not outward, thus avoiding injury to the vaginal membrane and adjacent parts.

As a result of investigations, Dr. R. T. Beatty, Department of Scientific Research and Experiment, Admiralty, concludes that some fishes can hear in a very dull and undifferentiated sort of way. The function of the otolith organs of fishes is the maintenance of balance; from them can be traced the development of the ear. Air-borne noises are transmitted to water with difficulty, though water is a good conductor of sounds that originate in it, and it appears that the story of the monastery carp which came for food at the sound of a bell is simply a myth. Dr. Beatty points out that it was only when vertebrates forsook the water to live in air that the hearing organ became more elaborate and efficient.—*Jour. Inst. Hyg.*

* * * * *

Musk rats are becoming a serious pest in Shropshire. Over 200 were killed in a month's organised campaign. There are five official trappers.

Abstracts

[Review of Results obtained in Austria with Anti-tuberculous Vaccination of Bovines by B C G (1925 to 1931). Gerlach, M., *Recueil de Médicine Vétérinaire.* April, 1932.]

M. Gerlach has submitted B C G to experimental study for seven years. For four years the method has been used for the vaccination of bovines belonging to strongly infected herds and he now feels justified in communicating briefly the results obtained in Austria up to date. Like every method of vaccination, B C G ought to be inoffensive and efficacious. Opinions on these points are still divided; some are insufficiently supported by systematic experiences.

Since 1925, M. Gerlach has published many of the results of his experiences with B C G: they are very varied and numerous and these are to be reckoned with in estimating the value of the method of Calmette and Guérin.

All the experiences proclaim B C G absolutely harmless and possessed of indubitable immunising powers. The author has always said that, to judge of immunising power of the vaccine applied to subjects living in tuberculous surroundings, a sufficiently long time must be allowed.

After the Austrian experiences the results confirm his resolve. He has nothing to withdraw from the favourable opinions expressed with regard to the method. This is gratifying to him, as he was responsible for introducing the method into Austria. The author continues to submit to rigorous control all observations tending to prove that B C G renews its virulence, which would render it unfit for practice. So far he has found no confirmation for the findings of Petroff, Hohn, Dreyer and others who maintain that B C G renews its virulence in certain experimental conditions realisable at will. The innocuity of B C G is held by the author as proved, provided that the indications of Calmette and Guérin for the technique of its preparation and for vaccination are observed.

Consequently, nothing is opposed to the introduction of the method in veterinary practice and its use in herds infected with tubercle for, as one sees in the course of the article, the results obtained are very encouraging. After three years' experimental work in the laboratory of the Institute at Molding, and after a sufficient number of newborn calves of tuberculous cows had been vaccinated by way of experience, the author undertook in Austria to vaccinate newborn calves in herds strongly infected with tuberculosis. After the first experiences it was deemed prudent to discontinue for a time. The veterinarians, a little disquieted and distrustful in the presence of a new method, preferred to await results.

This hesitation passed as happy results of the process were perceived; since then demands for vaccine have increased and now the vaccinations are done in different parts of Austria. There has been no propaganda; the method has made headway through its own usefulness, in spite of the reservations of sceptics.

Since January 1st, 1928, four thousand calves and bovines have been vaccinated in Austria: many re-vaccinated several times at intervals of a year. B C G injected into a calf gives to the animal great resistance to subsequent artificial virulent infection. In vaccinated calves absence of generalised or open tuberculosis is noted.

Massive infection of vaccinated subjects only produces a slowly evolving form of the malady. Veterinarians agree that vaccination and re-vaccination is well supported by calves, that local reaction is trivial and that the calves develop normally. In certain herds badly affected with tuberculosis, in which the rearing of calves was found almost impossible, since vaccination was introduced normal development has become the rule.

It is to be remarked that these vaccinations have been carried out on farms in which the cows may be tuberculous to the extent of 50 per cent. or more, and that the rules laid down at the Conference at Paris with regard to B C G —isolation, pasteurisation of milk, etc.—could not be carried out, and yet the results of the vaccination have been very favourable.

The fact that many breeders owning tuberculous cows are demanding vaccination of newborn calves is some proof of its efficacy.

At the beginning of 1932 inquiry was made among veterinarians in various parts of Austria as to the results of vaccination, and quotation is made from a few of the reports relative to large herds badly infected.

(1) First weeks after vaccination slight illness, cough. The development of calves perfect. This is the third year of vaccination on the farm. It is a striking fact that, since vaccinating, cases of tuberculosis found at slaughter are exceptional.

(2) New-born calves of tuberculous mothers vaccinated. They have sucked and thrived well and are negative to tuberculin.

(3) Sixty calves of tuberculous cows have been vaccinated, some two, three or four times. Five of these animals have died from accident or non-tubercle maladies and at autopsy no tuberculous lesion was discovered. The vaccinated thrive well and are in better condition than the non-vaccinated.

(4) The herd on this farm was taken over in 1922 and had been greatly neglected in the breeding sense. There were two hundred cows and one hundred and forty heifers. Apart from all forms of tuberculosis there was in the herd

much Johne's disease, abortion and different diseases of young stock, particularly pneumonia. It was decided to try B C G. Since March, 1928, two hundred newly-born calves were vaccinated, several re-vaccinated two, three or four times. All calves intended to be reared were vaccinated except some controls. Of the vaccinated animals some were sold for breeding, some slaughtered for food, some for defects of conformation, and some died of disease. In the result, the vaccination was found to be efficacious. In 1926-27 this herd consisted of 140 cows and 90 young bovines, of which 8·5 per cent. died each year of tubercle, mostly open and generalised. To-day there are 120 cows and 150 young bovines; the mortality from tuberculosis among them is not more than 0·5 per cent., and this result has been obtained in less than four years. It is to be noted that, when a case of tubercle is found, the lesion is small, delimited and calcifying.

It is clear that calves regularly vaccinated can be reared without a single fatality from tuberculosis, a condition not imaginable here four years ago. It may be added that in 1929 Johne's disease caused a mortality of 15 per cent. in the herd and that to-day this has fallen to 2 per cent.

(5) The Government of a province reported in November that bovines vaccinated (many three times) develop well and show no symptoms of tuberculosis.

Many other favourable reports have been received from different parts of Austria and none contain anything to the disadvantage of vaccination by B C G.

Résumé.

Vaccination is inoffensive; there is no reaction save that, rarely, a local abscess is observed.

Vaccination improves the subject's condition during development.

In vaccinated herds open and generalised forms of tuberculosis completely disappear.

Vaccination and re-vaccination with B C G is innocuous to calves and young bovines and undeniably has an immunising effect. The author considers the process of Calmette and Guérin a real advance in the fight against bovine tubercle, and that this method merits wide application.

W. R. D.

* * * * *

[The Hormone Diagnosis of Pregnancy in the Mare: The Position to Date. Kust. *D.T.W.* No. 21. May 21st, 1932. 336.]

The Aschheim-Zondek technique for gravidity, which diagnoses the existence of pregnancy in the human subject with a high degree of reliability, has no parallel significance when applied to domestic animals. This is due to a difference in the nature of the hormones in the various species. Extensive researches have shown that in the urine of the pregnant mare the hormones which are necessary for the Aschheim-Zondek test, are either absent or else present in very small amounts. On the other hand, ovarian hormone (folliculin, œstrin) is expelled in the urine of such mares in strikingly large amounts, and practical use of this was first of all made at Frankfurt. In the human subject the test depends on the demonstration in the urine of anterior pituitary hormone B, while in mares the important hormone is œstrin.

In 1930 the author examined 243 urine samples from 187 mares in various stages of pregnancy, and from the seventh week after service and onwards the hormone diagnosis was correct in 98 per cent. of cases. Experiments set up by Zondek gave similar good results. Schäper was able to confirm these results using Zondek's method, and found the earliest positive result 47 days after the last service. Two days after foaling the reaction was negative. Becker found that an earlier diagnosis could be obtained by using white mice instead of rats.

Experiments carried out by the author failed to show any advance in treating the original urine with ether, and he did not notice that such urine possessed a greater toxicity for mice as compared with rats. In the last two years 644 urine tests on 429 breeding mares have been conducted. The urine was allowed to sediment and without treatment injected subcutaneously into a series of five infantile white mice. Four or five days later vaginal smears were made, stained and examined. The expulsion of ovarian hormone during the first four weeks of pregnancy is so small—less than a mouse unit per c.c.—that it cannot be detected, but by the seventh week in 60 out of 78 cases, the amount had increased to over 1,000 mouse units per litre. Positive diagnoses were made only when at least two mice showed the onset of œstrum and where the urine contained more than 1,000 hormone units per litre. From these 644 examinations disagreement with the clinical sequel occurred in 42 cases, or 6·5 per cent., but from the beginning of the ninth week of the period of gestation, diagnosis was 98 per cent. reliable. Discussing the causes of errors the author mentions abnormalities of the ovaries, abortion, and lack of care in taking or handling samples of urine.

Preliminary tests using blood serum as well as urine have been in agreement, and it may be that serum will supersede urine as the test material.

W. L. S.

An appeal sent to the Prime Minister by the National Farmers' Union emphasises the financial straits of farmers and urges that the Cabinet should give early consideration to the critical position of agriculture.

Review

[**Neoplasms in Domesticated Animals.** By William H. Feldman, d.v.m., m.s. Published by W. B. Saunders Company, 1932.]

The veterinary student in this country would appear to be more fortunate than the student in American veterinary colleges where, according to the author, little attention is paid by the teaching staffs to the subject of tumours in animals.

The accounts of the macroscopic and microscopic characters of the tumours described are based upon the examination of specimens in the author's own collection, which number some six hundred; no description is given of some of the rarer specimens, as they were not represented in it.

The classification adopted is based upon that drawn up by Mallory. According to this, there are fifteen or sixteen types of cell in the animal body, each of which may give rise to two types of tumour—malignant and benign. The former are indicated in this classification by the termination "blastoma" and the latter by "oma," *e.g.*, fibroblastoma and fibroma. The author admits that this classification leads one into difficulties. For some reason, which is not clear, the author advises that the "use of clinical terms such as benign and malignant should be avoided if possible" (p. 29). Yet he uses them constantly throughout the book, and in connection with most of the tumours sections are headed "malignancy."

In the author's view, all the growths recognised as tumours are "simple tumours"; "mixed tumours" are referred to as teratomas. For some reason "the rather common mixed tumour of the kidney may conveniently be called 'embryonal nephroma'" (p. 29). This exclusive title appears to ignore the fact that tumours with exactly the same histology occur in parts far removed from the kidney.

The author does not recognise the terms round-cell and spindle-cell sarcoma. For him the former is a lymphoblastoma, and one gathers that it arises invariably in connection with pre-existing lymphoid tissue, and is very frequently associated with leukæmia (p. 203).

The spindle-cell sarcoma is, according to the author, a fibroblastoma. But in spite of the use of these names the term sarcoma, if used, must always be qualified in some way by the addition of a prefix fibro-, myxo-, etc. (p. 29). A few pages prior to this statement (pp. 23 and 24), the author describes figs. 1 and 2 as "sarcomata" without qualification.

The epithelial tumours are designated epithelioblastomas, and this appears to be one of the instances in which the classification adopted leads to difficulties, because the older terms papilloma, adenoma, and carcinoma are used for sub-divisions. Moreover, the first two are described as generally not malignant, while the last for the most part are malignant.

Many of the illustrations are excellent, but in some cases (*e.g.*, figs. 59 and 64) it is impossible to recognise the tissue depicted because no cell bodies are shown—only the nuclei are visible.

In other cases there is room for profound disagreement with the author's diagnosis. Fig. 15, on page 55, is described as a squamous-cell carcinoma, but it is quite clearly the well-known anal adenoma of the dog. The basement membrane surrounding the groups of epithelial cells is quite clearly shown.

It is difficult to appreciate why fig. 163 should be described as an adeno-carcinoma, while fig. 184 is described as an embryonal nephroma.

On page 173 there is figured a rhabdomyxo-sarcoma on the fore-leg of a horse. This lesion is said in the text to have "involved the tissues over the lateral aspect of the proximal portion of the right humerus,"—the figure clearly shows it to be situated opposite the upper (or proximal) extremity of the radius. It is said that diligent search was required to find muscle fibres with cross striation in the sections from this growth. The possibility that the striated cells actually found were pre-existing muscle cells, as is not unlikely considering the position of the growth, does not appear to have been considered.

Throughout the book quotations are made from statistics regarding the occurrence of tumours, many of which are not free from a suspicion of unreliability, if only on account of their age, and it may be said that the enumeration of tumours alone, even if the diagnosis be correct in every case, does not advance our knowledge very greatly. Age and sex distribution, as well as location, are important points.

The publishers' work has been well done.

An outbreak of an infectious ophthalmia in sheep on tall grass pasture in New South Wales was observed by Grahame. The disease was transmitted to healthy sheep by instillation of a drop of lachrymal fluid from an affected sheep. Various bacteria were isolated from affected sheep, but none of them proved pathogenic. Because of an increased resistance of recovered sheep, a filterable virus has been suspected as the cause.—*Bio. Abst.*

* * * * *

Australia persistently refuses to take British foundation breeding stock because of the fear of foot-and-mouth disease. At her present rate of progress Australia will be another ten to fifteen years before she has graded up her commercial beef herds to anything like the same level standard of quality prevailing in the Argentine.—*Daily Telegraph.*

Colonial Service Report

UGANDA PROTECTORATE

ANNUAL REPORT OF THE VETERINARY DEPARTMENT FOR THE YEAR 1931

The above report by the Director of Veterinary Services, Mr. W. F. Poulton, M.R.C.V.S., reviews very fully the activities of the Veterinary Department in Uganda during the past year. To it are appended reports by the Veterinary Pathologist, Mr. R. W. M. Mettam, on research, and by Mr. J. Carmichael on veterinary education. A description of the successful manner in which rinderpest has been dealt with occupies several pages and indicates the value of the "serum-*cum*-virus" method of inoculation. In exceptional circumstances this could not be applied, as, for example, when the blood-virus was infected with trypanosomes. It was also impracticable to create satisfactory camps for the cattle when the spread of trypanosomiasis would have been inevitable owing to the density of *S. calcitrans*. In South Toro, Western Province, buffalo and pig were infected with rinderpest at the beginning of the year "and thus was engendered a feeling of great uncertainty as to the future." The disease also broke out at Namasale, and it was found that a dead sitatunga (*Trag. spekei*) had been taken for eating purposes to the kraal in which rinderpest was subsequently recorded. Notwithstanding such difficulties, twenty-two out of twenty-four outbreaks were suppressed as the result of the measures adopted by the Department. Some 30,000 adult cattle and 8,000 calves were inoculated, with a mortality of 3,516 among the former and 2,723 among the latter.

Sixty-three outbreaks of trypanosomiasis were recorded, most of which were caused by *T. congolense*, but in a few *T. vivax* and *T. brucei* were responsible. Generally speaking, the outbreaks did not occasion serious loss, and native owners appreciated the value of segregation of infected animals and herds in non-tsetse areas as a means of preventing spread. No outbreaks of pleuro-pneumonia were recorded during the year, but black-water was reported from all parts of the Protectorate. It was considered doubtful, however, whether vaccination as a preventive measure was indicated. The measures instigated in 1930 against anthrax proved effective in preventing a serious epizootic during the year under review. The presence of tuberculosis was not infrequently revealed at the Kampala abattoir and the need for investigation into the problems presented by the disease in Ankole is emphasised. Canine piroplasmosis is regarded as enzootic through the Colony.

During the year Glossina investigations were carried out, the work being financed from the Colonial Development Fund on the recommendation of the Tsetse Fly Sub-Committee of the Economic Advisory Council. Experiments were designed to test a theory that the elimination of the *G. morsitans* over a wide area might be accomplished by the clearing of their primary foci alone, as distinct from clearing the entire "fly-belt." It is considered to be too early yet to decide the results of the work accomplished, but "it must be admitted that the future prospects of success are far from discouraging."

It is unfortunate that serious work at the Research Laboratory was "entirely out of the question during the year." Nevertheless, some useful work was accomplished. A valuable list of ticks encountered on various animals, and another of helminths identified, appear in the appendix. A report on Veterinary Education is presented in Appendix II, and the papers set in the Final Examination of native students are published in detail. It is to be hoped that the students fully appreciated the profundity of the knowledge imparted to them. Their notes on paracentesis abdominis, laparotomy, fistula, and hæmatoma, and their replies to the questions in obstetrics, entomology, medicine, pathology and bacteriology might prove interesting and instructive to their European confrères.

Ll. E. W. B.

"In the town of Hodmezavasarhely, Hungary, numbers of people have been bitten by specimens of a tropical fly of a species never yet seen before. The victims of this insect, which is said to be a dangerous carrier of disease, were bitten at night, when sleeping with open windows, and in some cases illness accompanied by fever resulted," says the *Journal of the Institute of Hygiene*.

"The introduction of dangerous tropical insects into European countries is a matter that is engaging the attention of our own Ministry of Health. It is regarded as not at all impossible that some of the fatal insect bites which occurred this summer may have been caused by tropical insects brought to England by air. It is pointed out that there is nothing to prevent disease-carrying insects from making extraordinary long flights in aeroplanes; they have a commodious machine at their disposal, with all kinds of nooks and crannies. They have been known to build nests in tubes and holes and cause mechanical troubles. At present the danger is not regarded as serious, but it is recognised that in certain circumstances it might be so."

* * * * *

"There can be no question about the increasing importance of the part played by the dog in the life of the people," says the *Daily Mail*. "In the hundred years 1831-1931, the human population of England and Wales increased nearly three times, while the canine population mounted from 300,000 to 3,000,000—a ten-fold increase. In the last twenty years the human population has increased 11 per cent., while the number of dogs has doubled."

* * * * *

At a meeting of the Herefordshire Diseases of Animals Committee it was decided to send a resolution to the Ministry of Agriculture, pressing for a universal sheep double-dipping order.

N.V.M.A. Divisional Reports

ROYAL COUNTIES V.M.A.*

MEETING AT WHIPSNADE

Presentation to Mr. G. P. Male

The summer meeting of the Royal Counties Division, N.V.M.A. was held, through the courtesy of Captain W. P. Beal, at the residence of the Veterinary Superintendent in the grounds of the Zoological Gardens, Whipsnade, on Friday, July 29th, 1932.

The President, Major F. J. Taylor, occupied the chair and the following members were present: Mr. J. R. Baxter, Mr. H. Bell, Mr. J. Bell, Captain R. E. C. Bullen, Professor J. B. Buxton, Mr. A. C. Dixon, Major J. J. Dunlop, Major H. G. Lepper, Mr. G. P. Male, Mr. J. W. McIntosh, Lieut.-Colonel P. J. Simpson, Dr. Leslie Sheather, Mr. G. S. Sutton, Major R. C. Tennant, Mr. F. T. Trewin and Mr. J. Willett.

Amongst the visitors present were: Mrs. Knight Barron, Mr. N. S. Barron, Mrs. J. R. Baxter, Miss Baxter, Mrs. Jack Baxter, Dr. and Mrs. John Bell, Mr. and Mrs. Randal Bell, Mr. T. J. Bosworth, Dr. Fred Bullock, Mrs. A. C. Dixon, Mrs. J. J. Dunlop, senr., Mr. R. E. Glover, Mr. B. Greenfield, Dorothy Greenfield, Mr. J. Greenfield, Mrs. G. P. Male, Mr. A. L. Martin, Mr. and Mrs. George Dunlop Martin, Mrs. J. McIntosh, Miss Kitty Sheather, Mrs. P. J. Simpson, Mrs. G. S. Sutton, Mrs. F. J. Taylor and the Misses Taylor, Mrs. Tennant, Miss Tennant and Mr. B. I. C. Tennant, Mr. S. N. Thrussell and Mrs. F. T. Trewin.

The minutes of the previous meeting, having been printed in the *Record*, were taken as read and adopted.

Apologies for absence were received from the following gentlemen: Captain J. C. Coleman, Captain H. B. Collet, Captain J. A. Craft, Mr. Paul Crosfield, Mr. C. H. Ducksbury, Major A. C. Duncan, Captain W. G. Green, Mr. E. J. Heather, Mr. C. W. Howard, Captain T. M. C. Hunt, Mr. C. P. Inglis, Mr. G. E. King, Captain W. L. Little, Mr. J. McKerlie, Major-General Sir J. Moore, Professor S. Pennington, Major G. Seldon, Mr. H. C. Shingler, Major S. L. Slocock, Colonel G. K. Walker, Major R. F. Wall, Mr. Ernest Wilkinson, Mr. F. W. Willett, Mr. Rex Willett, Professor Wooldridge, Captain E. C. Winter and Captain D. Wyllie.

Correspondence.—The Secretary read a letter from Mr. F. L. Cundell, expressing the thanks of his mother and himself for a message of sympathy which had been sent from the Association at the time of their bereavement.

Elections to Membership.—Mr. Barry G. Catmur, of Abingdon, and Miss P. M. Edmunds, National Institute for Research in Dairying, were unanimously elected to membership.

Place of Next Meeting.—It was decided to hold the November meeting of the Association in London.

PRESENTATION TO MR. G. P. MALE

At the close of the business meeting the President, in making a presentation to Mr. G. P. Male, made the following remarks:—

"It is my privilege and honour to make this small presentation to our late Honorary Treasurer, in recognition of his valuable services in this and other capacities to this Division for nearly a quarter of a century. (Applause.) We feel that it is only a minor offering for these truly major efforts on our behalf, and I feel sure I am expressing the feeling of all members when I say how deeply grateful and appreciative we all are for what he has so willingly done. (Hear, hear.) He has, as you all know, occupied during the past year the highest position of honour (and responsibility) our profession can offer as President of the Royal College of Veterinary Surgeons, and we are proud to remember that possibly his early association and training in this particular Division contributed in no small measure to his attaining the exalted position he has occupied with distinction, dignity and success. We have every reason to feel the 'pride of possession' with regard to our late Treasurer, for I think that no matter what offices may be his now or in the future, he will always consider this Division to have been his Alma Mater from a preliminary administrative and oratorical point of view.

"It is with great pleasure I hand this silver cigar cabinet to you, Mr. Male, with the sincere wish that it may always remind you of your own popularity and of our deep gratitude." (Loud applause.)

Mr. G. P. Male, in acknowledgment, said that he wished to thank the members most sincerely for the presentation which they had made him and also Major Taylor for the very kind remarks with which he had accompanied it.

He did not know to whom he was indebted as being the prime movers in that presentation, but he suspected that the President and Hon. Secretary had had a good deal to do with it; at all events it was kept very dark as far as he was concerned till a few days ago and it was a great pleasure to him now to accept their gift.

Thanks to the kindness and friendly help which had been accorded to him during his term of office, he could look back upon it as a very happy time.

As he had confessed on a former occasion, his good wife had done a great part of the work

* Received for publication September 9th.

which devolved on him as Treasurer and he knew that she would greatly appreciate the presentation.

He thought that the members were very long suffering, for after he had for nearly a quarter of a century badgered and bullied them for papers and subscriptions, they had thought fit to reward him in this way. He was very glad that they had not presented him with an arm-chair, for he still hoped to stand on his feet and do a lot more for the Division. (Hear, hear.)

It had been his aim to make the Royal Counties the first Division of the "National," and if by his efforts he had helped to put it amongst the foremost Divisions, that in itself was ample reward for his labours.

He would cherish their beautiful gift not only for its value but because of the kind way in which it had been given and the fact that it came from his friends—the members of the Royal Counties Division. (Applause.)

Lieut.-Colonel P. J. Simpson said that, as President of the N.V.M.A., he wished to associate himself with this presentation to one of the National's most ardent members.

Presidents of the "National" naturally watched with keen interest the well-being of the Divisions, and as doubtless Mr. Male had noticed during his term of office as President of the N.V.M.A., those Divisions that flourished and had well attended meetings had as their Secretary and/or Treasurer a man of unbounded energy and enthusiasm. In Mr. Male the Royal Counties V.M.A. had an outstanding example of such a Secretary and Treasurer. (Hear, hear.)

Mr. Male had carried the R.C.V.M.A. through a time when the "National" was practically non-existent as compared to its present status. This, Colonel Simpson explained, was said with all deference to those who were in office at that time. He did not wish to detract in any way from their capabilities, but in those days the parent body was unable to give the stimulus to Divisions which to-day it not only offered but thrust upon them; hence the duty of a secretary in finding subjects for discussion was more difficult at that time. Mr. Male had surmounted that difficulty and was entirely responsible for carrying on the work and holding the Division together during the difficult years of the War.

Colonel Simpson thought he might rightly claim Mr. Male as a long-standing personal friend, certainly not excepting the time when they were adjacent practitioners—(hear, hear)—and he for his part trusted that that friendship would long continue. Officially and unofficially, therefore, he congratulated Mr. Male on receiving that expression of admiration and goodwill from the fellow members of this Division, and at the same time he, as a member of the Royal Counties, congratulated the Division on having as a member such an ardent worker for the advancement of the profession as Mr. Male. (Applause.)

After the Presentation at Whipsnade.

Colonel Simpson having proposed a vote of thanks to the President for his conduct in the chair, the meeting closed.

After the business meeting the members and visitors and their ladies set off on a tour of the Zoological Gardens, most of the ladies going by 'bus and the remainder of the party on foot.

Captain Beal very kindly acted as guide and his information about the different animals, their habits, ailments, treatment, etc., was very interesting and contributed in a large measure to the enjoyment of the afternoon. The weather was not in its most kindly mood, but fortunately the rain held off until after tea.

Major and Mrs. Taylor entertained the party to tea, after which Major Taylor made a small presentation to Mrs. Male, observing that he did so with very great pleasure, and assuring her that they fully appreciated the value of her splendid work on their behalf—they were now enabled to realise why their late Treasurer made such a success of his office. (Applause.)

Mrs. Male graciously accepted the gift, with a few suitable remarks.

A hearty vote of thanks to Major and Mrs. Taylor for the very enjoyable tea was proposed by Professor Buxton and seconded by Mr. Jack Willett. Mr. John McIntosh proposed a warm vote of thanks to Captain Beal for his contribution to the success of the gathering and the members gave expression to their assent in loud applause.

H. Bell, *Hon. Secretary.*

Statistics issued by the Ministry of Agriculture indicate that, compared with 1931, the home output of dressed meat, represented by fat animals sold off farms in England and Wales during the year ended in May, 1932, increased by over 1,000,000 cwt., or 7 per cent., to nearly 16,500,000 cwt.

NORTH OF ENGLAND DIVISION*

A meeting of this Division was held at Armstrong College, Newcastle-on-Tyne, on July 2nd, 1932, when the chair was occupied by the President, Mr. H. Hicks, and the attendance book was signed by the following: Messrs. W. J. Young, J. Stewart, L. E. Perkins, C. G. Hill, T. Wilkinson, T. R. Jarvie, C. Nicholson, D. Starkey, R. Barker, H. S. Elphick, W. A. Doughty, W. H. Blackburn, P. Snaith, W. B. Towell, J. W. Rider, J. H. Taylor, H. P. Lightfoot, J. P. Isherwood, J. J. McDowall, W. L. Stewart and J. R. Rider (Hon. Secretary).

Visitors.—Professor G. Grey Turner, Dr. James Whillis, Messrs. A. E. Mortimer-Woolf and G. A. Mason.

Apologies for absence were received from Dr. Bradley, Principal Hobday, Messrs. Callender, Forbes and C. Elphick.

The minutes of the previous meeting were taken as read, and approved.

The report of the Council meeting, held at Durham on June 2nd, and dealing with domestic matters, was received and adopted.

Prior to calling on the Secretary to read his paper, the President offered, on behalf of the Division, a most cordial welcome to its visitors, who were distinguished members of the medical profession, and particularly to Mr. Mortimer-Woolf, who had brought a number of lantern slides illustrating the subject under discussion. He was sure these would add greatly to the interest and value of the proceedings.

The President regretted that Mr. Dunn had not been able, at that meeting, to give his paper on Poisoning in Animals, but expressed the hope that it would be possible for him to do so at a later time.

Paper.—The Hon. Secretary (Mr. J. R. Rider) presented a paper on "Diverticula of the Small Intestine," this being followed by an informative discussion. [Mr. Rider's paper and a report of the discussion are reproduced in the Clinical Section of this issue.—Ed., *V.R.*]

At the conclusion of the discussion members had an opportunity to examine the excellent collection of specimens of diverticula of the intestine, of both human and animal origin, which had been displayed for their inspection.

The customary votes of thanks terminated a very successful meeting.

J. R. Rider, *Hon. Secretary.*

* Received for publication August 17th.

According to a recent report in the *Journal of Clinical Investigation*, the most malignant tumours have a relatively high percentage of fat. The exact relation of fat content and malignancy has not been ascertained.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

* * * * *

DIARY OF EVENTS

Oct. 10th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

Oct. 1st.—New Five Years' Course, Membership R.C.V.S., comes into operation.

Oct. 3rd.—N.V.M.A. Committee Meetings, 2, Verulam Buildings, Gray's Inn, W.C.1: 2 p.m., Special Committee to make Nominations for Standing Committees for the Current Year; 3.30 p.m., Organising Committee.

Oct. 4th.—N.V.M.A. Committee Meetings, 2, Verulam Buildings, Gray's Inn, W.C.1: 10 a.m., Appointments Committee; 10.45 a.m., Veterinary Officers' and Public Health Committee; 12 noon, Parliamentary Committee.

N.V.M.A. Council Meeting, 10, Red Lion Square, W.C.1, 2.30 p.m.

Oct. 5th.—R.C.V.S. Committee Meetings.

Oct. 6th.—R.C.V.S. Committee Meetings.

Oct. 7th.—R.C.V.S. Committee and Council Meetings.

Oct. 8th.—Meeting of Scottish Society of Veterinary Inspectors, Royal Hotel, Glasgow, at 2.30 p.m.

Oct. 13th.—Central Division, Annual General Meeting at Red Lion Square, W.C.1, at 6.30 p.m.

Nov. 1st.—All changes of address for insertion in the 1933 Register to be reported to the Registrar, R.C.V.S.

* * * * *

N.V.M.A. Clinical Prize Scheme for Students

It is earnestly hoped that the entry for the above competition this year will show a substantial advance even upon the improved entry recorded in connection with the 1931-32 contest. Prospective entrants are reminded that their notes must be in the hands of the General Secretary, N.V.M.A., 2, Verulam Buildings, Gray's Inn, W.C.1, not later than Monday, October 10th.

R.C.V.S. OBITUARY

Shaw, William Frederick. Graduated London, July 10th, 1893; died September 21st, 1932; aged 69.

Mr. Shaw, himself a holder of the Fellowship, was the younger son of the late Henry King Shaw, F.R.C.V.S. In his earlier days an Inspector to the Board of Agriculture and to the Local Government Board, Mr. Shaw was subsequently for 40 years one of the Inspectors to the London County Council. In these capacities he is said to have made more *post-mortem* examinations of glandered horses than any other veterinary surgeon.

"Mr. Shaw was a man of modesty, wisdom and aspiration," writes a correspondent," and one of the most naturally fair-minded of men. Of an exceedingly retiring disposition, he disliked publicity intensely. His chief quality was his remarkable vigour, and as a public servant he had courage, initiative, independence, and judgment." Mr. Shaw leaves a widow and one son—Mr. John King Shaw, Veterinary Officer to the Wallasey Corporation.

* * * * *

PERSONAL

Fifty Years' Practice in Crieff.—"A Stirling man in the person of Mr. William Watt, M.R.C.V.S., Craigforth, Crieff, is this month celebrating his jubilee as a veterinary surgeon in Crieff, the capital of Upper Strathearn," says the *Stirling Journal* of September 8th.

"Mr. Watt is the youngest son of the late ex-Bailie Archibald Watt, and was born on the farm of Whitehouse, Stirling. He was educated at Stirling High School and Glasgow Veterinary College. In August, 1882, Mr. Watt succeeded to the Crieff practice of Mr. John MacGregor, who was killed through being thrown out of a conveyance when breaking in a young horse. Since then Mr. Watt has taken an active interest in the affairs of his adopted town, and has carried on his practice to the satisfaction of a large clientele. For over 20 years he has acted as veterinary officer for the Crieff district under the County Council and for a period of nine years he served on the Town Council. Not only is Mr. Watt celebrating his jubilee as veterinary surgeon at Crieff, but as a member of the Masonic Order he will have the same high honour in December. He is one of the oldest members of Lodge St. Michael (No. 38) Crieff, having been admitted in 1882.

"A keen sportsman, Mr. Watt, in his younger days, played a good deal of cricket. For some years when the late Mr. John McNee annually captained a team of veterans against Crieff C.C., Mr. Watt invariably wielded the bat with power and confidence. His favourite sport, nowadays, however, is curling. He has been a skip of the Ochtertyre Curling Club and is one of the original members. Mr. Watt was a member of the Ochtertyre team which won the prize played for on Loch Earn, on the only occasion within living memory when the loch was frozen—namely in 1895. But this does not exhaust the activities of this worthy Son of the Rock. He has long been keen on gardening and is a member of the Strathearn Horticultural Society, and also a member of the Dundee Society. He specialises in fruit and has more than held his own in competition with both amateur and professional gardeners.

"A few years after going to Crieff, Mr. Watt married Miss Ferguson, a member of an old Crieff family. He built his handsome residence, Craigforth, in Union Terrace, and there he brought up his family of two sons and two daughters, one of the former being now deceased."

PRESENTATION TO MR. EATON JONES

An illuminated address and a cheque were presented to Mr. T. Eaton Jones, late chief veterinary officer of the Liverpool Corporation, on behalf of the Liverpool May Day Parade Committee, the Royal Lancashire Agricultural Society, and the Shire Horse Society, by the Lord Mayor (Alderman J. C. Cross), at the Town Hall on September 20th, says the *Liverpool Post and Mercury.*

The Lord Mayor, in making the presentation, pointed out that Mr. Eaton Jones was appointed deputy veterinary officer in 1896, succeeding Mr. R. S. Reynolds as chief veterinary officer in 1901; his service of 36 years as a chief official being the longest of any chief official within living memory. He was a great authority on Shire horses, was honorary veterinary surgeon to the Lancashire Agricultural and the Shire Horse Societies, and to the Aintree Racecourse, honorary secretary of the May Day Parade, and had been a judge at many shows; receiving also the honour of being invited to be a judge at Olympia.

Mr. Eaton Jones, in reply, recalled that the May Day Parade commenced in 1866, and was then just a procession of horses, most of them belonging to the Corporation. Liverpool team-owners, however, had always taken the greatest pride in their horses, and some of those were also represented. A silver cup was presented in 1902, after which, with the presentation of many other prizes, the show had continued to grow until it possibly reached its apex last year.

"It has been stated, and, so far as my knowledge goes, never contradicted," said Mr. Eaton Jones, "that it is the finest show of working horses in the world."

* * * * *

BIRMINGHAM MEDICAL INSTITUTE.

At a meeting held in Birmingham on September 22nd, presided over by Dr. Walter Jordan, President of the Institute, it was resolved that a Section of Comparative Medicine be formed, and it was announced that the bye-laws of the Institute had been altered to admit any duly qualified and registered veterinary surgeon to full membership of the Institute.

The formation of the Section of Comparative Medicine has the warm approval of the Council of the Institute, and it is hoped that the Section will be of value particularly in studying diseases common to man and animals and their associated problems of pathology and bacteriology, in addition to matters of interest to veterinary surgeons alone.

This evidence of the closer co-operation between the two professions is to be greatly welcomed and it is hoped that a gratifying response will be made by veterinary surgeons in the Midlands. It is proposed to hold a meeting in the near future for which a large number of invitations will be issued. In the meantime, any information relative to the Section can be obtained from the Joint Secretaries of the Section of Comparative Medicine (Dr. A. P. Thomson, 72, Newhall Street, Birmingham, and Mr. H. W. Dawes, West Bromwich), or from the Librarian and Secretary of the Birmingham Medical Institute, 154, Great Charles Street, Birmingham.

* * * * *

CORRIGENDUM

Dr. G. C. Fraser, fourth paragraph, second column, page 1166 of last week's issue should read:—"Dr. A. C. Fraser."

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

* * * * *

INTRA-THORACIC ŒSOPHAGEAL OBSTRUCTION IN THE DOG

To the Editor of the Veterinary Record.

Sir,—May I be permitted, through the medium of your columns, to thank Professor J. G. Wright for so kindly contributing his views on the relief of the above condition in last week's issue of the *Record*, and for correcting a misstatement in a paper read by me before the Eastern Counties Division on May 15th, and published in your issue of September 10th.

I am glad to learn that it is considered that a more suitable operation than gastrotomy is available, and that the operation of presternal œsophagotomy is to be preferred, and has been successfully performed by him in a considerable number of cases for the relief of the condition.

I should also like to tender my most grateful thanks to Professor Wright for so kindly mentioning the date of the publication of *The Veterinary Journal* in which he described the operation advocated by him.

Yours faithfully,
A. F. Castle.

Villa Farm House,
Rushmere,
Ipswich.
September 20th, 1932.

* * * * *

LACTATION TETANY

To the Editor of the Veterinary Record.

Sir,—In opening the discussion upon Dr. Dryerre's paper, "Lactation Tetany," at Derby I made the remark "Magnesium is to Chlorophyll what Iron is to Hæmoglobin."

The following may be germane to the discussion published in your last issue.

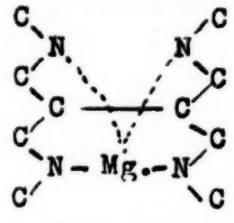
In "The Nature of Disease," Part 2, 1928, J. E. R. McDonagh, p. 130, one finds:—

"In plant life magnesium is of paramount importance playing the same rôle in chlorophyll as does iron in hæmoglobin."

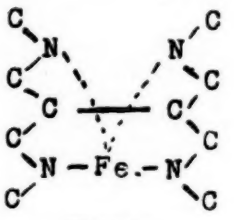
Haas and Hill in "Chemistry of Plant Products," 1928, p. 322, give the following formula for chlorophyll:—

(a) $C_{55}H_{72}O_5\ N_4\ Mg$
— $C_{55}H_{72}O_6\ N_4\ Mg$.
(b) $C_{55}H_{70}O_6\ N_4\ Mg$

Here also is to be found the following skeletal structural formulæ:—



Chlorophyll.



Hæmin.

Haas and Hill in the above-mentioned work give Willstatter "Annalen," 1906, 350, 48, as a reference.

Yours faithfully,
J. R. Barker.

St. Peter's Square,
Hereford.
September 20th, 1932.

The Editor acknowledges the receipt of the following:—

Communications from Messrs. J. Bell, Catford; T. Dalling, Beckenham; Ian A. Galloway, London; and Professor G. S. Wilson, London.

Report of Scottish Metropolitan Division, from Mr. J. N. Ritchie, Hon. Secretary.

Diseases of Animals Acts, 1894 to 1927

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
Period 1st to 15th September, 1932	No. 2	No. 2	No. 3	No. 300	No. 3	No. 3	No. 7	No. 43	No. 18
Corresponding period in 1931	15	17	4	397	8	37	4	70	30
1930	17	20	5	159	4	7	7	73	35
1929	16	20	3	744	1	2	1	93	42
Total 1st January to 15th September, 1932 ...	253	311	9	731	100	160	168	1,250	616
Corresponding period in 1931	353	397	94	10,307	114	210	211	1,384	581
1930	273	301	5	159	171	260	290	1,775	754
1929	322	404	26	2,639	163	329	373	1,625	961